

**EPIDEMIOLOGICAL STUDY OF
ACCIDENTAL INJURIES (LOCOMOTOR SYSTEM)
IN BUNDELKHAND REGION**

**THESIS
FOR
MASTER OF SURGERY
(ORTHOPAEDICS)**



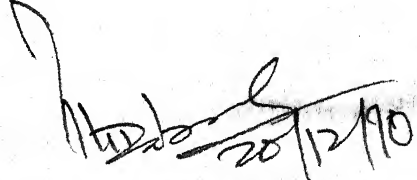
**BUNDELKHAND UNIVERSITY
JHANSI (U.P.)**

C E R T I F I C A T E

This is to certify that the work entitled
"EPIDEMIOLOGICAL STUDY OF ACCIDENTAL INJURIES
(LOCOMOTOR SYSTEM) IN BUNDELKHAND REGION", has been
carried out by Dr. SANT PRAKASH in the department of
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observations have been checked and verified by me
from time to time.

Dated:



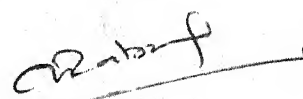
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A C K N O W L E D G E M E N T

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Sant Prakash
(SANT PRAKASH)

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INTRODUCTION

A frantic call to attend any emergency is not unusual to a medical man and one of the commonest emergency encountered is that of injury. A slip in bath room, fall from roof, road side accident, a mishappening in factory, criminal asault or injury with farm machines, animals, and various chemicals used in farm are all too common in civilian life. An automobile accident is far too common injury as more than 18 million people have been killed, disabled, maimed or crippled in it since the manufacture of first automobile by Mr. Henry ford in USA alone - more than total American killed in World War I, World War II, Korean War, Vietnam War and all other wars involving United States (Dankenbring, 1969). It exceeds all crime of violence by ratio of 10:1 in America. At present rate, one out of every two Americans can expect to be killed or injured in a traffic accident during his/her life time. On other front house hold or court yard is also not free from such mishaps particularly in India.

In todays' world there are dangers everywhere. In the world accident injuries rank fifth among the leading cause of death (Michel Mancieux and Claude J. Romer). Cities growing vertically and horizontally at a diabolical pace and population bomb ticking off for zero hour, science and technology growing like a monolith taking precedence over all other social priorities, man is paying a heavy price for the very progress which has

started recoiling on him. Over last two decades a healthy school of opinion has emerged postulating that man and nature have to live together as one individual unit for the very survival of human species. It is against this background that one has to delve in detail into growing number of road accidents spawned by proliferation of the four wheel monsters, rampaging along our city and village road, moving down precious lives. The twentieth century saw the growth of automobile almost into a frankenstein out to destroy the very same species which has assiduously built up man's quickest means of conveyance on road (Ravindran Nair, 1982).

The increasing industrialization and urbanisation all over the world, has resulted in rapid growth of transport system with greater movement of people and goods. The transport system specially on road continue to grow both in developed and developing countries as key element in economic and social development. In rural area too, national highways are being built for high speed traffic with little thought given to need and problems of road users specially pedestrians and animals. Apparently this creates a chaotic situation which often result in road accident. Every where accidents are proving to be major and increasing cause of injury which often result in hospitalization, disability and even death among school going children, the young people and elderly persons (Agarwal, 1985).

In case of road accidents the interaction is between driver, vehicle and the road. There, the most important factor, is the perception and behaviour of road users, such as the observance of traffic signs, choice of speed and decision on when to over take or cross the road etc. The conference commended by WHO for its concern with its growing threats to public health and for extending its activities from the developed countries of the world to encompass all the WHO regions. The Mexico conference was the first WHO International Conference on road traffic accidents in developing countries and as such it marked an important mile stone in attempts at the International level to combat the problem. Road accidents on highways are greatest killers of young people of our country accounting more death than epidemics, tidal waves and malnutrition (Agarwal ND).

Farm accidents take a large toll in life and limb and affect men, women and children to the extent that they are a leading cause of death and disability. The agricultural workers and their family have share in the experience because of their occupation. Farm injuries are also on increase in India due to increase in mechanization of agriculture (WHO TRS, No. 246). They are mainly caused by machines, such as threshers, belt in pumping sets, tractors and animals. Electrocution accident occur where naked wires present. Chemicals and insecticides used in farming may also some time cause accidents.

In Punjab, Haryana, and Western Uttar Pradesh, particularly, every grain harvesting and cane crushing season leaves hundred of farm workers without fingers, hands or forearms - their limbs chopped off in threshers or mutilated in crushers (Kamla Mankekar, 1981).

Industrialization has brought in its wake several problems. One such is accidents which constitute a major cause of industrial hazards. They are common cause of death and disability. With rapid advancement in industrial processes, newer types of dangers to life, limb and health are being increasingly introduced (Brig. Chaddha, S.L., 1978). Every year a thousand workers die and another two lakh fifty thousand are injured in industrial accidents in India. These figures pertained to only organised industry. There are thousand of others crippled in accidents in the unorganised sector.

Most of the accidents are avoidable by taking proper precautionary measures. Illiteracy and lack of knowledge of proper precautions are an important factors in India to cause accidents. In Western countries the mechanization of agriculture started since 1920 but in India it is still in developing stage.

DEFINITION OF HOME

Domestic accidents take place in or around the home and for the purposes of study the home must be understood to include the dwelling unit itself, the garden

Gā rage and all that is personal to the household (WHO, 1957a, Brit. Med. Assoc., 1964). Also included are the area of stairs and approaches to flats or room, so long as they are reserved for the use by tenants (United States, Deptt. Health Education Welfare, 1958).

Accidents in the home as cause of injury and death are of increasing importance accounting for about half of the accidental deaths and equivalent in public health term of major epidemic, common accidents noted are falls, burns, poisoning, animal and snake bites, cuts and bruises, Electrocution and electric burns, drowning explosion injuries and sport injuries. Injuries from sharp or pointed instruments (including injuries from fire arms or cutting or thrusting weapons).

Home accidents includes injuries within family dwelling, inside the hut and in its immediate surrounding as usually cattle shed, just by the side of house and food may be cooked out side or fire wood and agriculture implements may be stocked by the side of house. Eighteen percent of all the accidents were in this situation and more in females as compared to males.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

HISTORY

Accidents are older than history. The natural hazards, must have participated in the evolution of man. Dangers were the agents of natural selection (Gibson, 1961). Some of the ancient cave paintings provide evidence for this.

"Act of God" "Luck", "Chance" etc., were some of the culturally acceptable explanations of accidents for a long time. To many people they still are, though these terms are now less applicable to diseases than before.

Coming to more recent times, often it was dramatic misfortunes that attracted the attention of the people. For example, the Michagen Forest fires in 1882 got the American Red Cross interested in accidents. Similarly by 1903 the American Medical Association was conscious of the burn and other mishaps. Accidental poisoning was recognised by 1910 when Lye used to be a common house hold article in USA (Gordon, 1962).

The first organised movement in Great Britain against accidents was the formation of the society first council, now known as the Royal Society for prevention of accidents, London in 1916 (Editorial, 1966).

With the publication of series of reports by the medical research committee (Later Medical Research Council), Industrial Health Research Board, Great

Britain, between 1919 and 1937, the concept of accident proneness caught the imagination of all and research in accident took a new turn towards the study of personality.

The advent of automobiles introduced a new element. In 1924, the U.S. Government called for a conference on street and highway safety. Rightly they discussed accidents in home, industry and other places too, as case of diseases the community responsibility of accidents was first with medical profession. Role of the public health department was first pointed out by Earlie Brown of Kansas who called accident a killer and emphasized the nature of its specific causation and mentioned practical and reasonable measures of prevention.

The ancient literatures refers to accidents. For instance the Bible (Knox, 1963) mentioned that Absalom got caught by the tangled branches of a great oak tree while riding fast on a mule underneath. The ancient Egyptian book of etiquette "Percepts of Anii" warned that consuming too much of beer was conducive to accidents (WHO, 1966).

The epidemiological approach to accidents was first tried during the second world war for prevention of trench foot (Gordon, 1949).

In 1955 the Swedish Government drew attention the World Health Assembly to accidents, specially among children in Europe. Neatherland also referred the matter to the Executive Board. As a result came out

the WHO Technical Report Series, No. 118 "Accidents in Childhood" (WHO, 1957).

Currently the world Health Organisation and various national Governments specially in the developed countries are spending vast sums on accident research. Pursuit is going on in various directions by physicians engineers, social scientists, psychologists etc.

A major epidemiological revolution in Western Europe since the second world war, has been reversal of the rates of infectious diseases and accidents as a cause of death.

In 1946, in England and Wales deaths due to infectious diseases of all types were twice as those due to accidents (28,000 and 14,000 respectively). Five years later the two were equal and by 1966 deaths from infectious diseases were less than one quarter of those due to accidents (4,400 and 19,000). Both domestic and road accidents deaths have increased during this period. The main change has been a reduction of mortality from infectious diseases but accident figures have increased by nearly 30 percent during last fifteen years (Bha jekar, 1971)

Accident represent a major epidemic of non communicable disease in the present century. In developed and many developing countries road traffic accidents are now main cause of death and disability, particularly in young adults. World statistics are incomplete but are sufficient to give an out line of this

man-made twentieth century epidemic.

Since India became independent, there has been a tremendous development in industry, construction of new road and increase in heavy and high speed traffic. Farming has been completely mechanised in certain states over the years. This change in the country's complexion has led to a marked increase in accidents on roads, in factories and on farms. Accidents can be classified as follows :

1. Road accidents : Road accidents are the most common important regarding mortality and morbidity.
2. Farm accidents.
3. Industrial accidents.
 - a. Organised industries i.e. factories.
 - b. Unorganised industries i.e. small scale cottage industries (Agarwal, ND, 1985).
 - c. Domestic accidents and
4. Rail accidents and disasters.

NATIONAL AND INTERNATIONAL LEVEL

Accidents on Indian roads seem to be mounting in same proportion at the increase in number of vehicles. In 1960, there were 38,818 recorded accidents which took a total of 4,491 lives. The vehicle population then was about 6.5 lakhs (Agarwal, ND, 1985).

Accidents between 1946 and 1956 rose by 15 percent while the increase in population was only five percent (in Great Britain). The increase among accidents

was particularly in domestic and transport accidents while occupational accidents have declined (Bull, 1961).

There were only 2 motor vehicle accident deaths in Great Britain in 1898 while in USA only one person died in 1899. But in 1957 there were 102,532 deaths in automobile accidents in 47 member countries the WHO alone (WHO, 1962).

According to WHO (1965), the annual deaths due to traffic accidents have more than doubled in 10 years in many countries. Similar trends are reported from several developing countries.

Ibrahim (1966) stated in weekly news paper that in India during seven years immediately preceding Dec. 31, 1964, the motor vehicle accident rose by 151 percent while the automobiles and the population increase was only 96 and 17 percent respectively. On the basis of deaths per 1,000 vehicles India is already in second highest position amongst the countries of the world.

There has been a 10 percent rise in the accidental deaths among American men of the working ages, between 1961 and 1964 (Statistical Bulletin, 1967).

Accidents are now one of leading cause of death in Western countries. Total number of death due to accident in USA exceeded one million (actual 1038430) in Great Britain-40988, in Japan-40447, West Germany-35295, in France-32955, Italy-23171, Mexico-19831, Poland-11838, Canada-10569 (Seal SC, 1964).

Number of accidental deaths in India
by causes during 1983-1985.

Sl. No.	Causes	No. of accidental deaths		
		1983	1984	1985
A. <u>Natural Causes</u>				
1.	Lighting	1884	1406	1381
2.	Heat stroke	630	503	533
3.	Floods	849	774	565
4.	Cold and exposure	428	361	361
5.	Land slide	576	506	588
6.	Cyclones	131	691	502
Total		4498	4241	3930
B. <u>Other Causes</u>				
1.	Firearm	1478	1796	1860
2.	By explosion	398	438	391
3.	House collapse	1501	1220	1341
4.	On road	23375	29375	29831
5.	In factories	688	666	585
6.	Railways	13124	12735	13307
7.	Air crash	56	52	85
8.	Fire	15372	15741	16667
9.	By poisoning	5736	6735	8560
10.	Animal biting/killing	4946	4767	4867
11.	Drowning	23217	22729	21592
12.	Miscellaneous	34187	34133	36641
Total		124078	130387	135727

The records in Calcutta city hospitals show that in 1963 a total of 10835 cases of accidents were treated of which 884 proved fatal. Death toll increased to 961 in 1964. In that city road accidents increased from 3678 in 1955 to 5085 in 1964. i.e. 40 percent rise in 10 years. The road casualties in Calcutta during 1963 and 1964 against total accidents recorded in hospitals are given below :

<u>Year</u>	<u>Fatal</u>	<u>Total No.of road injuries</u>	<u>No.of accidents</u>	<u>Total</u>
1963	228	4292	11516	16036
1964	245	4549	11487	16281
Increase/ decrease	+17	4 257	- 29	+ 245

In India, accidents are definitely on the increase. Between 1957 and 1979 accidents increased by 461 percent while in same period the increase in population was 156 percent and increase in the number of vehicles was 1677 percent. In absolute number 40000 people were killed in road accidents in 1986, as against 24600 in 1980. India has a fatality rate in road accidents that is 20 times that of developed countries (Park, 1989).

Different types of accidents cause clinically similar injuries, but from epidemiological point of view of causation and prevention, accidents are classified into following broad groups.

A ROAD TRAFFIC ACCIDENTS

In many countries motor vehicle accidents rank first among the all fatal accidents. There are almost 300,000 deaths from road accidents annually in the world and the fatal casualties number upto 10 million. In addition every death there are as many as 30 to 40 minor injuries and 10 to 15 serious injuries requiring long period of expensive care, nursing and treatment(WHO, 1981).

In USA (1957) deaths at all ages from road traffic accidents (38,702) exceeded these due to all infectious and communicable diseases (WHO, 1961).

In India, accidents have increased from 72,000 in 1965 to 1,07,000 in 1968 while number of death increased from 8392 in 1965 to 12555 in 1968. Eight persons get killed per 1000 vehicles in India whereas in Britain, France, West Germany, Italy and USA the death figure per thousand vehicle is only one (Park, 1981).

According to Leo A. Kaprio about 2,50,000 people or more are killed on the roads of the world each year. In 1974, 50,000 people died in the USA as a result of road traffice accidents. In three countries of Europe, Italy, and the U.K. nearly 35000 were killed in road accidents. In 1973 there were over seven million injured in road accidents throughout the world . Among those who died 90,000 were first hospitalised for period upto 30 days. Two million motor vehicles on India's roads its people

suffer a road death toll ten to fifteen times greater than U.K. and U.S.A. (Swasth . Hind, 1979).

It is estimated that 11142 road accidents were reported in Tamil Nadu, during 1970. In these, 1039 persons were killed and 9,370 injured. It is rather shocking that the total number of accidents in Tamil Nadu during 1976 was 11655 (Christopher Daniel, 1973).

India had one of the highest road accident rate in the world. One out of 42 vehicles in the country met with accident in 1986. In US and Europe the average is one in every 100 vehicles. In 1986, 40,000 people were killed in road accidents as against 24,600 in 1980. The number of people injured in road accidents doubled in past six years, touching 1.75 lakh in 1986 (Park JE, 1979).

B. DOMESTIC ACCIDENTS

In developed countries like UK and USA, there has been marked increase in road and domestic accidents over the past ten years. More than one third of the accidental deaths in England and Wales occur in and around home, another one third occur on roads and about seven percent in industries (Bull, 1965)

"Accident in home as causes of injury and death are of increasing importance, accounting for about half of the accidental deaths and equivalent in public healthy terms of a major epidemic. Yet in most countries both the medical professional and the general public are slow to recognise the fact" (WHO, 1966).

Domestic accidents are frequent cause of death

or disability at the extreme of life they account for about 75 percent of injuries to people over 65 in the industrialised countries (Park JE, 1989).

Bickett (1965) showed proportionate contribution of all accidental deaths of domestic accidents at three periods (1951, 1956 and 1960) in England and Wales.

Year	Total deaths	Total accidental deaths	Total domestic accidental deaths
1951	549380	15105	4964
1956	521331	16407	5916
1960	526268	17720	6008

There was decline by the 26 percent in the number of total accidents amongst children in England and Wales between 1951 and 1956 (England and Wales, Ministry of Health, 1957). Significant domestic accident rates declining slowly in western countries. Domestic accident death rate has declined quite rapidly perhaps as much as 50 percent in twenty five years in USA.

Each year in Great Britain 6000 people die as a result of accidents in the home, 100,000 are admitted to hospital and some 1 million receive treatment from their general practitioner

In period of six month in 1977, 30097 domestic accidents were recorded in 20 hospitals in England and Wales. The types of the accidents were as given below.

Type of injury	No. of cases	Percentage
Cut	10609	34.4
Fracture/dislocation	3738	12.1
Contusions	3296	10.4
Sprains	2747	8.9
Burn	1100	3.6
Scald	1011	3.6
Wound from painted object	810	2.6
Inhalation/ingestion	789	2.6
Foreign body in an orifice in eye	753	2.4
Concussion	356	1.2
Splinters	248	0.8
Poisoning	57	0.2
Electric shock	17	0.1

(Symposium on epidemiology of accident trauma and resulting disabilities. Strasbourg, 1981)

Mittal et al (1972) reported total of 375 cases during course of study. Most common cause in domestic accident was due to fall (38.9 percent) followed by burn (24.3 percent).

Ghosh et al (1972) reported a total of 8205 accidents in which home accidents, Agriculture construction and blast accidents were 2204, 1948, 1556 and 111 respectively.

Gill et al (1977) reported that the highest number of accident were due to domestic accidents 41 (37.5%) while road accidents were 30 (37.5%) and school accidents were 2 (2.5 percent).

OCCUPATIONAL ACCIDENTS

Bull (1965) estimated that more than 15 million minor injuries and one third of a million serious injuries occurred in industries of England and Wales per year. The frequency rate of injuries in India in 1982 was 0.05 and 16.25 in fatal and non fatal respectively (India Labour year book, 1963).

Brockington reported that over a third of the total spells off work of all the working population in England was due to accident.

The enormous amount of lifting, carrying and moving of raw materials, price of parts and product of factories is responsible for many accidents. More than 38,000 (27 percent) of all accidents occurred in this way in 1958. In 1932, corresponding figure was 24,000 (23 percent) of all accidents.

In 1958, seven thousand accidents due to the transport (excluding rail) in and about factories i.e. power trucks, stackers and so forth which since the end of 11nd world war increased many fold. The accidents in the factories from this cause have more than doubled in the 10 years since 1948 (Bramley and Harker).

In developed countries because of industrialization new hazards have been introduced not only at work and during transportation but also in homes. The American Medical Association estimated that in 1957 there were 2,50,000 toxic or potentially toxic product in the

consumer market (Verhalst and Cann, 1960). Another example is the common rotary cutter used in the kitchen (WHO, 1966).

The changes due to industrialization which have occurred in developed countries in some fifty years are increasing much faster in developing countries. The socio-cultural change which results in recent migrants from an agricultural to industrial milieu has important implication in accident causation.

However, by better planning design, training etc. the occupational death rates have declined in the west. In USA, these rates for 1961 were only half of 1937 rate (Baetjer, 1966).

In Great Britain about one third each of total industrial accidents occur in factories and in works of building construction. A further one-fifth occur in transport services (Bhajeekar AB, 1971).

Every year almost a thousand workers die and another 250000 are injured, some of them receiving permanent disability. Industrial accidents in India, in West Bengal, industrial accidents rose 20 percent in four years from 1974 to 1978. In 1979, Maharashtra alone accounted for 93,000 injured and 155 dead in industrial mishaps (Mankekar Kamala, 1981).

Every year, two lakhs workers are injured in factories in India. About 450 of them are killed and many are disabled and crippled for life. This is

considered very modest estimate as large number of minor accidents are not reported (Brig. Chaddha, 1978).

A study carried out by Gill et al (1978) data of 80 cases of accident were analysed in which factory school and railway total accidents were 6(7.5%), 2(2.5%), and 1(1.25%) respectively.

Agarwal et al (1981) showed that large number of accidents occur in the factories. The number of accidents are reported employees state insurance corporation for Punjab was 5623 in 1980 and 6051 in 1981.

Railway Accident : Park (1989) showed daily over 11,000 trains carry over on crone passenger through out the country. With increase number of trains and passengers, the increase in number of accidents and casualties resulting there form is not expected. In 1981, there were 12,408 deaths as against 7133 deaths in 1967. The main factor is involved in railway accident is human failure.

3. RANK OF ACCIDENTS

Accident constitute variable epidemic. They rank now third in order among the leading causes of death and responsible for approximately ten percent of all deaths in developed countries. They are also the chief cause of death among person age 10-24 years between 12 and 65 percent deaths.

Accident as a proportion of all causes
of death among person aged 10-24 years.

Country	Year	Percentage
Egypt	1978	12.3
Thailand	1980	19.9
Singapore	1981	25.2
Japan	1980	36.0
England and Wales	1980	45.9
France	1978	54.6
U.S.A.	1978	54.5
Australia	1980	63.3

India has one of the highest road accident rate in the world. One out of every 42 vehicle in the country met with an accident in 1986. In USA and Europe average is one in every hundred vehicles.

3. INCIDENCE

As in some case of diseases, the incidence of accident is difficult to findout. However, a few surveys such as the one done in USA by department of Health education and welfare, in Scotland by Mac Queen (1960) and in Ludhiyana, Punjab, by Gordon et al (1962) have thrown some light on the incidence.

In USA, the national healthy surveys conducted between 1958 and 1961 covered injuries also. However, this included non accidental injuries too. They considered only injuries which resulted in one or more days of restricted activity or medical attendance. The

incidence of injuries was estimated to be 255 per 1000 population during the period of 1959 to 1961 (Baefer, 1965).

The Bhore Committee (1946) had reported 54174 accidents in the industries of which 9,111 were serious and the other minor.

According to Gupta (1962) on average 22 persons in factories, mines, railways and docks, were being injured per hours in 1958 in India.

Gordon et al (1962) conducted a survey of traumatic accidents in four villages of Ludhiyana district, Punjab, India. They considered only those injuries which produced a disability for at least one day. The incidence observed was 115.6 per thousand with 4.3 percent permanent crippling.

A study conducted by Ghosh et al (1972), 8205 accidents were recorded for four year period from 1967 to 1971 in eight districts of Himachal Pradesh which had population 2970981 at that time. They observed agricultural accidents 30.88 percent and construction work, mainly road building 24.66 percent are two important areas where large number of accidents occur in Himachal Pradesh. Accidents occurring at home, agricultural field and construction site put together are responsible for 90.51 percent of total accidents.

One fourth (25.50 percent) of all accidents in motor vehicle accidents corresponding figure for USA is 42.2 percent. Himachal Pradesh is having very high motor

vehicle accident in comparison to other part of India. Accident due to fall were 11.07 percent.

In study of industrial workers at Lucknow it was found that 23.5 percent workers had one or more accidents in one year and 92.9 percent of the accidents occurred while working in the factory. The average number of accidents per worker of those who met some accident was 1.3 and per 100 employee it was 21. The number of working class lost per accident was 7 and per hundred employees was 220 (Zaidi, 1965).

India is one of the country which has highest road accident rate in the world. One accident out of every forty two vehicles in 1986, while in US and Europe, the average is one in every hundred vehicles (Park JE, 1989).

MORTALITY

Accident is a leading cause of death for forty member countries of the World Health Organisation in both the hemispheres. Mortality mainly affects young people (WHO, 1967a and b).

According to WHO (1966b) over 100,000 persons are killed annually in road accidents exceed those from all communicable diseases. Lancet in a leading article (Editorial, 1963) has pointed out that accidents at home are responsible for even more deaths than by motor vehicles.

In USA, accidents is the first cause of death for ages between 1 and 36 years. Males under 20 years constitute 40 percent of all deaths from accidents and for male of 15 to 24 years accident mortality exceeds deaths from all causes combined (DHEW- PHS, 1960).

In Japan the leading cause of deaths from non transport accidents is fires and explosions, closely followed by falls, 21 percent due to drowning and 16 percent due to poisoning (WHO, 1965a).

Accidents accounted for 5 percent of all deaths in United Kingdom. In non transport accident mortality, poisoning contributes 22 percent.

In Ceylon 24 percent of the non transport accidental deaths are due to drowning, 20 percent fires and over 10 percent each bites and stings and falls (WHO, 1965d). In Tehran drowning is the chief cause of death from non transport accidents. Falls and blow from object closely follow it. Fires accounted for 18 percent, poisoning and electricity also account for 4 and 3 percent in this group respectively (WHO, 1965a).

The Bhoré Committee (1946) reported 323 fatal accidents in the industries. According to Gupta (1961) the fatal accidents in Indian factories mines and railways have despite fluctuations between generally on the increase. The death rate per 1000 workers in factories was 0.09 in 1947 and 0.12 in 1958.

The Rajasthan state has reported that in 1960 there were 22 motor vehicle (19 in males and 3 in females)

and 464 other accidents (males-298, females-166) and in 1961 corresponding figures were 21 (15 and 6) and 436 (267 and 169). The data for 1961 represent 22% of all the deaths in the state (WHO, 1966).

In Nagpur, fires account for 37 percent, drowning 19 percent, falls 5 percent and poisoning 3 percent of the non transport accidental deaths (WHO, 1965a).

Gordon et al (1962) give 63.3 per 100,000 as the death rate from accidents for 11 Ludhiyana villages. They consider it high for a area without automobiles, factories or electricity.

Mittal BN et al (1972) reported 375 domestic accidental injuries during course of study at Allahabad. Incidence rate was 29 per thousand persons per year.

In 1974 there were an estimated 250,000 deaths in two million traffic accidents, for each death there are several hundred non fatal accidents and many be ten percent or more permanent disabilities (Park JE, 1989).

Gunaratne (1979) quoted statistics to illustrate the similarity in data on accidents in developed and developing countries. While three of four percent of deaths in India were accounted by natural causes such as lighting flood, land slide, exposure to cold and cyclones, nearly 22 percent accidental death were due to drowning, 12.9 percent due to traffic accidents, ten percent due to train accidents and eight percent due to poisoning. On average 1,000 deaths occurred every day on the road world wide.

MORBIDITY

Like incidence, this is also difficult to assess. The human cost, chronic handicap, deformity, pain, grief, separation, family disruption, economic loss etc, are all affects of accidents.

According to DHEW-PHS (1960), out of nearly 47 million injured in 1958, 11 million incurred in bed disabling injury. Interm of days they estimated that each year the injuries result in 124 million days of restricted activity, 114 million days of bed disability and 107 million work loss days. Gordon et al (1962) found that in 11 Punjab villages there were for very fatal accident, 7.9 non fatal ones with varying degree of crippling and 183 with disability for one day or longer.

Economic cost is difficult to calculate. According to American Medical Association and National Safety Council the wage loss (1,550,000,000 dollars) medical expenses (150,000,000 dollars), property damage (1850,000,000 dollars) and insurance (1,750,000,000 dollars) adding upto colossal sums are spent on road accidents alone (WHO, 1962a).

Backet (WHO, 1965) adds that for every fatal domestic accident there are 150 significant non fatal ones (with disability for one or more days or involving medical care), 550 more with disability for less than 24 hours and 3,500 without disability.

Economic loss due to accidents in USA is estimated at 5.3 billion dollars annually. In 1957 motor vehicle accidents alone caused about 4,21,1000 man years loss at ages 20-29 years compared to about 98,00 due to diseases of heart (WHO, 1962).

The estimated cost of domestic accidents in U.K. is above pound 500 million annually (Editorial, 1963) and for industrial injuries pounds 70 million (Featherstone, 1964).

Industrial accidents in 1958 in India, 91.86 percent resulted in temporary disablement, 5.86 percent in permanent disability and 2.28 percent were fatal (Bhajeekar et al, 1971).

According to time (1966) the cost of wage losses, medical and insurance expenses totalled dollar 18 billion USA, in 1965 from accidents involving 104,000 persons killed, 10.5 million disabled and 52.5 million injured.

Huge sums of money are paid by Employees State Insurance Corporation as compensation for industrial accidents in India every year (Zaidi, 1969).

5. AGE/SEX

Children especially boys have more accidents with low death rate and elderly persons have low incidence with high death rate (WHO, 1966a).

Domestic and pedestrian accidents are commoner

in extreme of age, while collision type of motor vehicle and occupational accidents are more found in young adults (Bull, 1961).

King (1955) observed that in rural accidents maximum incidence was observed in 15 to 20 years age group and minimum in 31 to 35 years with tendency to rise again thereafter.

CHILDREN

Poisoning is common in young children with peak at 2 years (Craig and Forster, 1953 and Jacobziner, 1959).

Burn is also common in children under 5 years. It is common in India where cooking is mostly done on the floor or ground (Fowler, 1956 and WHO, 1965a).

Children under 7 years have more accidents than older children (Gupta, 1961).

Gordon et al (1962) found that children below 15 years had the highest accident rate in Ludhiyana (Though severity was greater in older persons) School going children showed high incidence of 41.25% of all accidents (Gill et al, 1978).

ADOLESCENT AND YOUNG ADULT

From his study of about 35,000 accidents over 19 years Schulzinger (1956) found that the peak was at 21 years, within the range of 17 to 28 years.

Out of 21,587 casualties and fatal accident

records analysed by Gharpure et al (1952a and b). The age group of 10-35 years was found to be most affected.

DRIVERS

Males under 30 especially between 18 and 23 years contributed heavily to the accidents than those beyond. Young adults and teen age drivers are also found to be involved in a disproportionately large number of single vehicle accidents (Mc Farland and Moor, 1957).

But case control study on automobile accidents in New York by Mc Carrol and Haddon (1962) did not find any evidence to support the widely accepted view that young drivers cause more of fatal accidents.

INDUSTRIAL WORKERS

Bhajekar et al (1971) reported accidental injuries, among Bombay port trust employees 70 percent of injured workers were below the age of 40 years.

ADULT AND MIDDLE AGED AND POSTMIDDLE AGED

Mc Farland (1958a) stated that for drivers past middle age due to impaired efficiency of senses and slower reaction time the rate tends to increase though many of them compensate by slower driving, less driving at night etc.

According to norman (WHO, 1962) adult and middle aged drivers, have lower accident rates. Lowest is between 50 and 60 years.

But in the case of pedestrians, Haddon et al (1961) found that age increases the risk of accident as well as death when involved. Falls as cause of death assumes greater importance after 34 years. By 55 to 64 years of age, it accounts for a sixth of accidental mortality. Similarly fires and machinery accidents recorded a rising mortality with advancing age among men. At ages 45 to 64 years fires was the third and machinery the fourth cause of accidental deaths.

Ghosh et al (1971) showed that the age group between 15 to 44 years which is main workinggroup of population is responsible for 56.5 percent of the accidental cases.

ELDERLY PERSONS

Older persons have more fall due to poorer sensory and motor functions. In USA more than 75 percent of those killed by falls are 65 years and over (DHEW-PHS, 1960).

The elderly present the chief problem. In a study relating to accidents to distance walked those aged 65 and over had three times the accident rate of the 30-39 age groups (the 'safest' group) and 20 times fatal accidents.

According to WHO (1962 and 1966b) dangerous age for all classes of road users is above 65 years. and 15-25 years. Agate J, (1966) states that 75 percent fatal home accidents involved persons above 65 years

and that 50 percent are above 75 years age. In 9 out of 10 fall fatalities the victim is elderly.

SEX

Men are more susceptible to accidents at all ages except the very young and very old. And they are also more vulnerable to fatal accidents (WHO, 1966a).

In over all incidence males predominate except falls handling objects and non motor transport (Collins, 1944).

Schulzinger (1956) observed that males have significantly higher incidence than females (except the 1st year) specially repeated accidents. However, in USA women of the low income group have more accidents than men (DHEW-PHS, 1960).

In USA more than 213 of all accidents occur in males except falls. And in the occupational category it is almost exclusive (Mc Iver, 1961).

Datta et al (1961) observed ratio of 8:3 for males and females accidents in Pondicherry. Gordon et al (1962) observed higher accident rate in females in field study of Punjab, India.

Fire accounts for 35 percent of non transport accident mortality in females in Ceylon while fall from tree cause 21 percent deaths for males from non transport causes in Ceylon. These are also related to occupation (WHO, 1965a).

In Bombay, out of the 21,587 non fatal and 1,848 fatal accidents, the cases records of which were analysed by Gharpure et al (1959), females formed only 10 and 5 percent respectively.

According to WHO (1965a) in Nagpur, among non transport accident mortality, women are more susceptible to burn and scalds (25 and 40 percent respectively) than men (3 and 19 percent). But males have more accidental deaths from falls (12 percent) and drowning (28 percent) than females (4 and 13 percent respectively).

CHILDREN

Among children pedestrians risk for boys is more than in girls (WHO, 1962a). Rao (1966) found that in his series of 91 burns in Delhi (hospital) that the sex ratio was 2 : 1.

Gill et al (1978) reported highest accident rate for both sexes was 51.25 percent amongst children of school going age.

ADOLESCENT

Girls have fewer accidents and are among the best risks on the road (Backett, 1959). Normal (WHO, 1962) says that girls except under 1 years are 5 times less susceptible.

ADULTS

The general excesses of males in road fatalities has its peak in the young adult where the

sex ratio is 10 : 1 (Backett, 1959).

Lauer (1952) says that apart from being the major contributor in road accident male drivers also take 5 years before improving their accident record, Females on the contrary show improvement from the start. But according to Mc Farland and Moor (1960), it is difficult to say whether females are safer drivers or not because of disproportionate amount of driving between the two sexes.

Women have less accident than men doing comparative jobs. In a study by physiological and industrial hygiene section of All India Institute of Hygiene and Public Health, Calcutta, the ratio was 5:24 for reportable accidents in 1946 in Bengal (Sabnis and Rao, 1961).

But investigation into 93 percent of the fatally injured motor vehicle drivers in New York showed that they were all males (Mc Carrol and Haddon, 1962).

Ghosh et al (1971) reported highest number of accidents in Home (34.97 percent) in which males (33.52 percent) and females (86.94 percent).

ELDERLY PERSONS

Over 65 years more females die from falls (Gordon, 1949). In USA nearly 315 of the fatal falls were in women of 65 years and over. In non fatal variety the retired females had twice as many accidents as males (DHEW-PHS, 1960).

Agarwal et al (1985), in Punjab, increasing loss of limbs is being reported as result of THRESHER accidents. In year 1976, as many as 294 cases were reported from PUNJAB. In year 1980, three hundred one cases were reported. Many cases must have remained unrecorded. Most of these accidents were due to use of improper threshers without safeguards.

A study from Ceylon (WHO, 1960) showed that high percentage of local accidents (21 percent) among the males which were due to fall from the trees, since one of the important occupations of the male population is toddy tapping and picking of coconuts.

7. EFFECT OF ALCOHOL, DRUGS

The association between alcohol and accidents was known to ancient Egyptians (1,500 B.C.). One of the main dangers of alcohol is that of accident on the road, at work and in the home. Beyond 0.03 percent blood alcohol concentration, which may be considered normal, the chance of accident increases in geometrical progression. Roughly each rise of blood alcohol by 2 percent doubles the risk.

DRIVERS

Bjerver and Goldberg (1950) conducted an experiment on expert drivers accustomed to moderate amounts of alcohol and found that with 0.4 to 0.6 percent blood alcohol

According to Agate (1966) above 65 years 3 percent of all males and 4.8 percent of all females die from accidents. Fall is twice as common in females as males.

6. OCCUPATION

Occupation plays a significant role in the prevalence of accidents. Those working in mines, airways, railways, marine transport, factories, industries, workshops, machine, shops jetties etc. run a much greater risk than others. Similarly motor drivers, house builders, mountaineers, Army field operators, motorist cyclist and those engaged in various constructional work (like bridges, tunnels) loading and unloading, cutting woods, plucking fruits etc. also largely exposed to accident (Seal et al, 1961).

Death for persons engaged in mining, quarrying oils and gas wells were about 170/100,000 compared to 50 of those in agriculture and construction in U.S. in 1947 (Gordon, 1949).

For house keeping, females had a disproportionately higher accident rate of 22.5 percent compared to only three percent in males (DHEW-PHS, 1959).

Gordon et al (1962) found that the accident pattern was closely related to farm activity in the mainly agriculture community of Ludhiyana villages.

driving ability was reduced by 25 to 30 percent. According to them the threshold level of impairment was 0.035 to 0.09 percent in blood for expert drivers moderately accustomed to alcohol.

It has been shown many times that the drinking driver is particularly prone to accidents(e.g. Freimuth et al, 1958).

In Perth, Australia, Pearson (1957) found that of 218 fatal road accidents victims, 86(39.4 percent) had an alcohol concentration, 100 mg/dl of blood or more and 53(24.3 percent) had 200 mg/dl or more.

Banciu et al (1957) in Romania, 457 drivers examined with presumptive evidence of alcohol consumption of whom 128 drivers were involved in accidents.

Loomis and West (1958) used a stimulator and showed that there is direct relationship between blood alcohol concentration and impairment of functions.

The likelihood of accident rises even with relatively low levels of alcohol, and at higher levels the chance increases sharply (Mc Farland and Moore, 1957 and Mc Farland, 1958b).

Implication of alcohol has come from several countries like Australia, Canada, Germany, Italy, Scandinavia, South Africa, U.K., observed in blood alcohol concentrations of even 0.03 percent which is considerably below the legally accepted level of intoxication in U.S.A.

Using the "Miles driving Trainer" Drew et al (1958) found that low blood alcohol concentration of 20 to 30 mg/dl affects timing of controlled movements. At 80 mg percent there was 16 percent deterioration.

Some controlled studies carried out in Sweden showed that scores obtained by a group of expert drivers were poorer by 25 to 35 percent after alcohol consumption to the level of 0.04 to 0.06 percent. Some showed increased errors with as little as 0.032 percent. Individual variations are common. An insight into the quality of performance was lost first. In turn it deteriorated the standard of performance. As alcohol is eliminated slowly from nervous tissues, the effect may last for 14 to 18 hours or even more (Mc Farland, 1958).

Haddon et al (1959) concluded that alcohol is casual factor in more than 50 percent of the single motor vehicle fatal accidents studied by them.

A study of private motor vehicle accidents by airway by Barmac and Payne (1961) showed that pre-accident drinking was present in 69.5 percent of the cases. Driving after drinking was 12 times commoner in cases than controles. Abuser of alcohol and excessive drinkers were over-represented in the case series.

Cohen et al (1958) studied the effect of alcohol on experienced drivers with safe records and nil to moderate drinking habits. Results showed that alcohol

increased the percentage of risk takers. With increasing alcohol intake their performance deteriorated progressively. They concluded that even small doses (smaller than 0.5 mg percent considered safe by National safety Council, USA or 80 mg per 100 ml of blood considered safe limit by British Medical Journal, U.K. produced impairment of judgement and driving skill while creating false confidence. Such people are more dangerous than heavily drunken who are usually unable to drive.

Schmidt and Smart (Canada) (1959) found that the alcoholic drivers were involved in a significantly large number of accident per year and per mile driven.

Haddon and Bradess (1959) showed study of 83 drivers killed in single vehicle accidents, involving neither other vehicles nor pedestrians revealed that 41 (49 percent) had blood alcohol level of 150 mg per 100 ml or more at death and further 17 (20%) had level 50 to 150 mg/100 ml.

According to WHO (1966) alcohol is involved in half of all total driver accidents and in one third of the fatal pedestrian accidents.

Hypnotic, sedative and tranquillizers to be prescribed with caution for drivers. The side effect of antihistaminics vary considerably. Miller (1957) suggested that patients taking these drugs should not drive until they have established by trial that they not experience significant side effect.

Nevertheless an investigation by the Food and Drug Administration of the United States uncovered a "dopring" which was illegally selling the Amphetamine sulphate tablet as "benny pills", "Copilots" or "Stay-awake pills" to the truck industry in 1953-55. Fatigue and depression normally followed by initial stimulation.

Miller (1957) suggested that if dose of Amphetamine does not exceed 10 mg, a driver may be permitted to prolong driving for a period of not more than two hours, the drug should not be repeated on the same day.

Various tests were conducted to study the effect of tranquillizers on skill of driving. Three tranquillizers (a barbiturate, a benzodiazepine and a phenothiazine) impaired performance in male series of tests. But the volunteers were unaware of any impairment (B.M.J., 1979). Using a pharmacological methods, an American study of drugs in living and fatally injured drivers suggested that stimulants increased the risk of fatal accidents 14 times and sedatives and antihistamines five times but tranquillizers not et al (Glauz and Blackburn, 1975).

The transport and road research laboratory's survey in Berkshire also looked at drug use. Eighty seven of the 2211 drivers at a fault were considered to have been impaired by a drug other than alcohol (non admitted to drug abuse). Thirty one of these who had taken a drug had also been drinking, and in 14 (12 percent) of these accidents where alcohol was thought to have been

a major factor, the drivers had also taken drugs including monoamine oxidase inhibitors and other psychotropic drugs (Storie V.J., B.M.J., 1978).

Harvard (1976) has discussed the effect of main types of drugs and medicines and the precautions that should be taken on medical aspect of fitness to drivers. He emphasized the dangers of exceeding the prescribed dose or taking combination of drugs especially if one is alcohol and driving first few days of treatment when the effect may be most noticeable.

PEDESTRIANS

Haddon et al (1962) stated that studies in Illinois and Canada showed that elevated blood alcohol levels may be more frequent in pedestrians than drivers. A controlled study of the characteristics of adult pedestrians fatally injured in Manhattan showed that like drivers, the ability of pedestrians to negotiate the city traffic without mishap was deteriorated even in low concentration (10 to 90 mg percent) of alcohol. Another observation was that increasing age with little alcohol and middle age with much alcohol separately carried greater risk of fatal involvement.

Gerber (1954) measured the blood alcohol concentration in 1755 victims of fatal road traffic accidents, all were over 15 years of age and died within 12 hours of accident, of these victims, 49 percent had measurable

amount of alcohol in their blood (19 percent with 200 mg alcohol or more per 100 ml, 6 percent with 50 to 190 mg/100 ml, 4 percent with 40 mg/dl or less). Three fourths of the victims were pedestrians, 49 percent of whom also had alcohol in their blood.

IN INDUSTRY

A french study on industrial workers showed that accident victims had higher percentage of alcohol than controls (WHO, 1966a).

AT HOME

The correlation between domestic accidents and drinking is yet to be studied. But is believed by experts that alcohol is related to domestic accidents too (WHO, 1966d).

8. EFFECT OF VEHICLE (TYPE)

In United Kingdom (1958) only 7481(2.5%) of 299767 casualties in road accidents were considered by the police at the scene of accident to be due to defect in brakes, tires and steering.

In the National vehicle safety checkup programme in the United State in 1959 (National Safety Council, 1960) one out of five passengers cars and one out of four trucks checked were found to be need of maintenance attention for safe driving. Lights and Brakes two factors of great importance for safety, were principal item needing attention on both passenger cars and trucks.

In study of vehicular defects in eleven states of United State (National Safety Council, 1960), about two out of five vehicles tested, were found unsafe, among individual states, four had vehicle rejections exceeding 50 percent, and the highest was 72 percent. Head lights led the list, being defective on 24 percent of all vehicles. In order of frequency defective brakes,- 17 percent, rear light-15 percent, steering-10 percent, glass-5 percent, and tires-one percent.

According to National Safety Council (1960) in United States 7.2 percent of drivers involved in accidents were considered to have visual obstruction on the vehicle (e.g. rain, snow, or wind shield, other wind shield obstruction load on vehicle), in the United Kingdom (Great Britain, Ministry of Transport and Civil Aviation, 1959a) only 64 of 299767 road casualties were considered to be due to the cause.

Driver of modern vehicle sits in an atmosphere which may be fairly completely sealed from the out side air. Although several ventilation aids are available, he may not use them. The resulting warm and comfortable condition may induce drowsiness. Defective exhaust escape of dangerous fumes into interior of the vehicle.

Pedestrians obviously come from encounter with motor vehicles. The legs are the chief sites of injury,

though impact with the bumper, but the head in case of life threatening injuries - which are more often caused by striking the vehicle, especially with the wind screen than the ground (Astle, Paddor and Mackay, 1977).

Harris (1977) pointed out that energy absorbing materials and 'collapse' features can lessen the impacts. Solutions clearly must be incorporated in vehicle design as matter of urgency (B.M.J., 1979).

For motor cycle riders the main cause of death is also head injury, but severe injuries to chest and abdomen are common. A feature of motor cycle fatalities is both the multiplicity and the great severity of trauma sustained. For surviving motor cycle riders injuries to the extremities occur with great frequency, those to the legs often cause significant long term disabilities.

A feature of motor cycle casualties in industrialized countries in particular is a very significant proportion of survivors with serious brain damage. Rehabilitation prospects for those casualties are poor and cost of health care is extremely high.

For bicycle riders head injuries predominate amongst both fatal casualties and survivors. Lower limb injuries are fairly frequent, and a specific problem of foot injuries to child cyclist from spokes has been identified.

For car occupant, in fatal cases both head and chest injuries are of almost equal importance, among

survivors lower limb injuries are a frequent cause of disabilities. The use of seat belts by car occupants reduces the risk of all types of injuries. Among Car occupants who are injured, the use of seat belt changes the anatomical distribution of injuries and also, for collision of equivalent impact severity, reduces markedly the risk of specific injuries. For unbelted occupants ejection is still identified as an important mechanism of injuries, although it has been reduced with introduction of anti-burst lock designs in car doors.

For occupant of light vans, pattern of injury vary significantly from those of car occupants. Ejection is more important mechanism of injury, lower leg injuries occur more frequently.

For occupants of truck, injuries differ substantially from those of car occupant. Severe injuries to the lower leg are particularly prominent amongst serious casualties, chest and head injuries are relatively less frequent. Fatal injuries are strongly associated with massive intrusion of car structure or with ejection of the occupants (WHO, 1979, Europe).

9. EXPERIENCE OF DRIVER

Farmer and Chamber (1939) showed that experience reduces accident rate, though it does not affect accident proneness.

Study of a single vehicle accident and drivers indicated that susceptibility of younger drivers may be due to inexperience. A study of personal injury accidents in Great Britain also supported the view that inexperience is a major factor in teenage accidents (Mc Farland and Moore, 1960).

Rastogi (1962) observed that increasing experience reduced the accident rate among industrial workers in Kanpur.

According to Norman (WHO, 1962) adult and middle age drivers have lower accident rate. Lowest is between 50 to 60 years of age.

Mc Farland (1958a) stated that for drivers of past middle age due to impaired efficiency of senses and slower reaction time the rate of accidents tends to increase, though many of them compensate by slower driving, less driving at night etc.

Drivers who have not been trained properly fails to react correctly in emergencies, though they are able to drive in normal conditions (Thorley, 1961).

Ignorance, lack of education and inexperience are also causes of accidents (Sabnis and Gupta, 1961).

MATERIAL AND METHODS

M A T E R I A L A N D M E T H O D S

The study has been conducted in patient and out patient departments of M.L.B. Medical College and associated hospitals, Jhansi among the cases of accidental injuries. Epidemiological aspect of injuries has been studied during one year from January, 1989 to December, 1989 covering 1,000 cases of accidental injuries.

The study has been carried out with special reference to extent of injuries and period of hospitalisation and other relevant factors. Information has been collected in pretested proforma. All cases of accidental injuries, numbering 1,000 personally interviewed. They were socio-economically classified by the criterion suggested by Verma et al (1980). Disabilities were evaluated as a result of accident. In cases of unconscious patients, the relevant information was collected from close relative or friends who stayed with patient and later on modified when patient was able to respond.

In case of very young children information was almost completely taken from the parents or close relatives. The answers were accepted as such unless there was reason to believe otherwise.

All these subjects were followed up in wards and out door patient department of orthopaedics till discharge, death or absconding.

LIMITATIONS

Some cases were not in a position to be interviewed because of early death, immaturity or deaf, mutism. In such cases possible information was collected from close relatives.

It was impossible to get correct and reliable information about personality. In the case of some important questions like those dealing with the patients, personal life or attitudes, honest answers could not be obtained. Their delicate and personal nature was something the unsophisticated (mostly rural) persons could neither understand nor respond. While there was no manifest uncooperation except few cases. The answers to those key questions were what they considered "proper" or desirable rather than truthful.

This difficulty through suspected earlier was fully realised only often the study was well in progress. It was soon evident that the personality assessment was not only futile, but even worse. Because wrong data was being collected. Ultimately it was decided to delete this part from study rather than arise at incorrect conclusions.

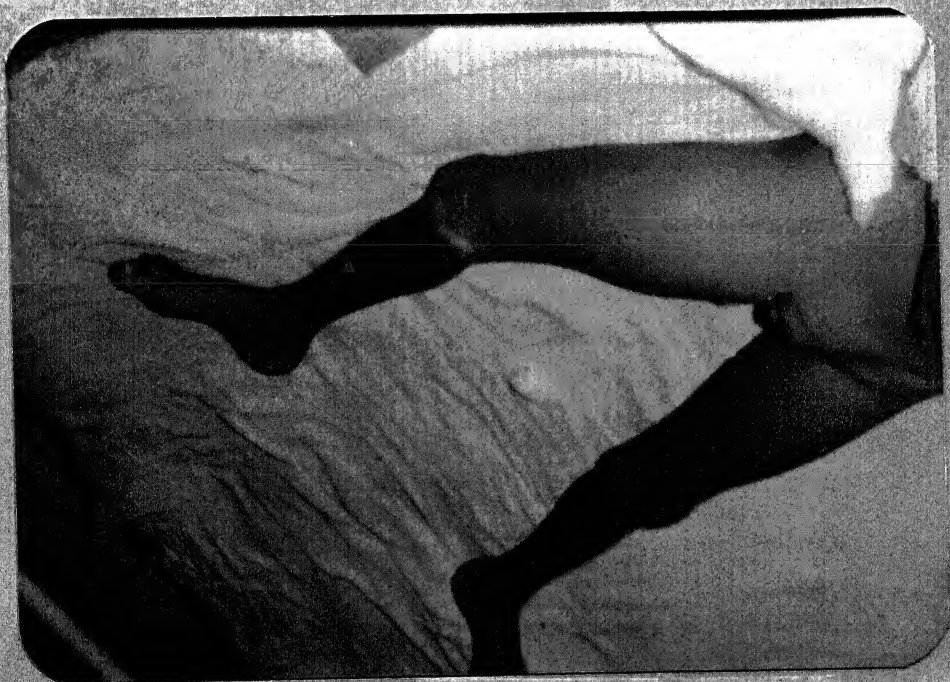
A similar tendency though to a smaller extent was present in assessing the responsibility and some of the contributory factors. But this was circumvented largely by indirect questioning.



This patient sustained severe
compound fracture right tibia
with soft tissue injury.



Traumatic amputation of right
thigh and forearm in railway
accident.



Patient sustained simple
fracture shaft femur right side
run over by jeep.



Compound fracture of both bones
of leg with severe crushing
injuries to soft tissue.



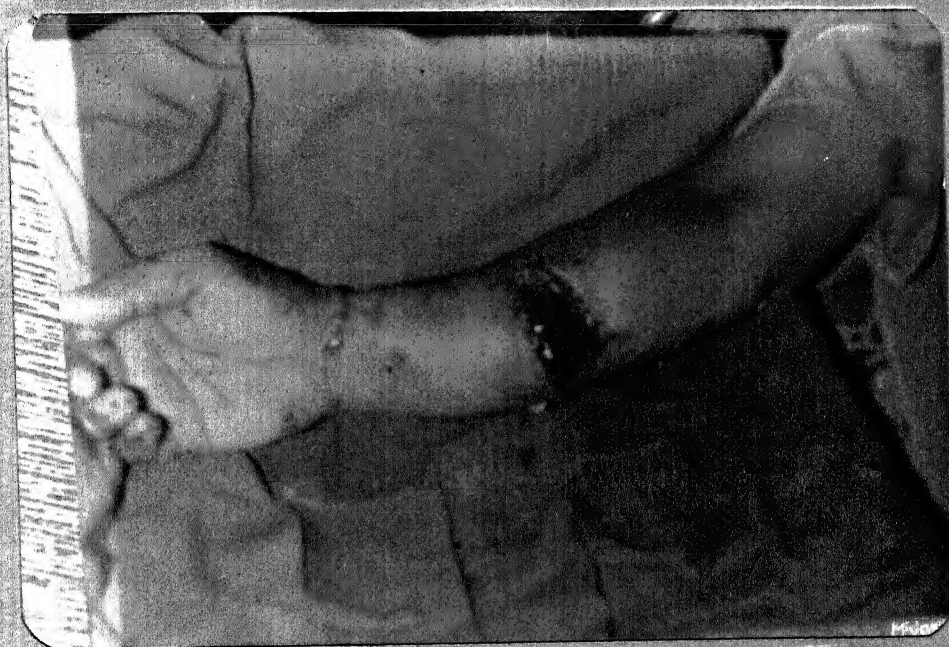
Crush injury of ring and little
finger by machinery only dist
and Grease are present over hand.



Severe crushing injury of hand
by thresher during operation
Multiple pieces of metacarpal
and carpal bones are exposed.



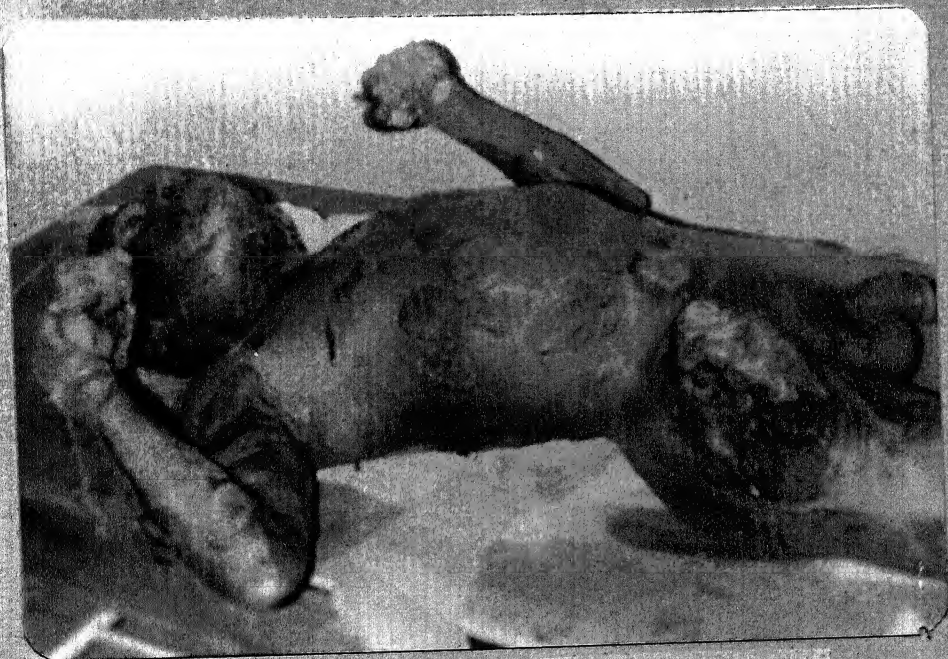
Severe lacerated injury of shoulder,
arm and disorganisation of right
side of elbow by belt of machinery.
Articular surfaces of elbow joint
are exposed.



Fracture of both bones of forearm
with lacerated injury flexor
aspect of right forearm by edge
of tractor trolley.



Right forearm is chopped off
in thresher during operation.



Patient sustained severe injury
by Electrocution.

O B S E R V A T I O N S

O B S E R V A T I O N SEXTERNAL CAUSES IN RELATION TO ACCIDENTS

Table 1 shows that motor vehicle accident is the commonest (32.70%) cause of external accidents followed by accidentnal fall (31.30%).

Accident due to all other transport (Bullock cart/cycle/train) were 18.7% while accidents due to other causes (Lathi, curtain rods, animals, sharp instrument and electrocution) were only 7.50%.

Table 1 : Distribution of accidents according to their causes.

Type of accidents	Code No.	No. of cases	Percentage
Motor vehicle	AE 138	327	32.70
Other transport	AE 139	187	18.70
Falls	AE 141	313	31.30
Machinery	AE 142	57	5.70
Explosion	AE 143	29	2.90
Gun shot	AE 145	12	1.20
Others	AE 147	75	7.50
TOTAL		1000	100.00

TABLE 2 : Distribution of cases according to age and sex.

Age group (years)	Sex	Motor vehicle		Other Transport		Falls		Machinery		Explosion		Gunshot		Other causes		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0 - 5	M	3	0.92	1	00.53	7	2.23	1	1.35	-	-	-	-	-	-	12	1.20
	F	2	0.61	3	1.70	8	2.56	-	-	-	-	-	-	-	-	13	1.30
6 - 15	M	17	5.19	31	16.57	38	12.14	2	3.51	1	3.45	-	-	5	6.67	94	9.40
	F	17	5.19	11	5.88	12	3.83	4	7.02	3	10.34	-	-	1	1.33	48	4.80
16 - 24	M	211	64.53	56	45.98	125	39.94	38	66.67	21	72.41	7	58.33	40	53.33	528	52.80
	F	24	7.34	15	8.02	28	8.95	5	8.77	2	6.90	2	16.67	10	13.33	86	6.60
45 and above	M	39	11.93	23	12.29	70	22.36	7	12.28	1	3.45	3	25.00	12	16.00	155	15.50
	F	14	4.28	17	9.09	25	7.99	-	-	1	3.45	-	-	7	9.33	64	6.40
Total	M	270	82.57	141	75.40	240	76.68	48	84.20	23	79.30	10	83.33	57	76.70	789	
	F	57	17.43	46	24.60	73	23.32	9	15.80	6	20.70	2	16.67	18	24.00	211	
TOTAL		327	100.0	187	100.0	313	100.0	57	100.0	29	100.0	12	100.0	75	100.0	1000	100.0

ACCIDENTS IN RELATION TO AGE AND SEX

As shown in table 2, maximum number of cases of accidents occurred 61.40 percent in age group of 16-44 years and minimum 2.50 percent in age group of 0-5 years. In different types of accidents, 71.86 percent accidents occurred in age group of 16-44 years and minimum 1.53 percent in age group of 0-5 years due to motor vehicles. All types of accidents were more in age group of 16-44 years and minimum in 0-5 years.

Males contributed 78.90 percent and females accounted for 21.10 percent of total accidents. Maximum accidents in males, 64.53 percent occurred due to motor vehicle and maximum accidents 8.95 percent due to fall in age group of 16-44 years. Minimum number of males and females were occurred 3.45 percent each of them in age group of 45 years and above.

RELIGION IN RELATION TO ACCIDENTS

Table 3 depicts that maximum 92.50 percent accidents occurred in Hindus followed by 5.50 percent in Muslims. In different types of accidents, motor vehicle accounted for maximum 92.35 percent accidents among Hindus and minimum 1.22 percent in Sikh and others. Second common accidental fall accounted for maximum 92.33 percent accidents in Hindus followed by Muslims (5.75%).

Other transport accident contributed maximum 93.58 percent in Hindus followed by 2.67 percent in Muslims. Minimum accidents occurred in Sikh & others (1.60%).

TABLE 3 : Distribution of accidents according to their religion.

Type of accidents	Hindu		Muslim		Christian		Sikh&Others		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Motor vehicle	302	92.35	21	6.42	-	-	4	1.22	327	32.70
Other transport	175	93.58	5	2.67	4	2.14	3	1.60	187	18.70
Falls	289	92.33	18	5.75	5	1.60	1	0.32	313	31.30
Machinery	54	94.74	3	5.26	-	-	-	-	57	5.70
Explosion	24	82.76	3	10.34	2	6.90	-	-	29	2.90
Fire arms	10	83.33	2	16.67	-	-	-	-	12	1.20
By other causes	71	94.67	3	4.00	1	1.33	-	-	75	7.50
TOTAL	925	92.50	55	5.50	12	1.20	8	0.80	1000	100.0

TABLE 4 : Distribution of cases according to education.

Type of accidents	Illiterate		Primary		Secondary		College/higher		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Motor vehicle	66	20.18	49	14.99	75	22.94	137	41.90	327	32.70
Other transport	112	59.90	29	15.51	34	18.18	12	6.42	187	18.70
Falls	209	66.77	39	12.46	50	15.97	15	4.79	313	31.30
Machinery	14	24.56	21	36.84	16	28.07	6	10.53	57	5.70
Explosion	15	51.72	6	20.70	6	20.70	2	6.90	29	2.90
Gun shot	3	25.00	1	8.33	5	41.67	3	25.00	12	1.20
Other causes	47	62.67	9	12.00	15	20.00	4	5.33	75	7.50
TOTAL	466	46.60	154	15.40	201	20.10	179	17.90	1000	100.0

LITERACY IN RELATION TO ACCIDENTS

As shown in table 4, illiterate cases were having 46.60 percent followed by secondary educated cases (20.10 percent). Minimum accidents occurred among primary educated cases were having 15.40 percent.

In different types of accidents, in motor vehicle accident maximum 40.90 percent accidents occurred in college/higher educated cases followed by secondary educated cases (22.94 percent).

In other transport accidents, maximum 66.67 percent accidents in illiterate and minimum (6.42 percent) accidents in college/higher educated cases.

In accidental falls, maximum (66.67 percent) accidents occurred in illiterate cases and minimum in college/higher educated cases (4.79 percent). Machinery accidents were more common (36.84%) in primary educated cases. Gun shot accidents were more common (41.67%) in secondary educated cases while explosion accounted for 51.22 percent in illiterate cases.

In other causes, maximum accidents (62.67 percent) accidents were occurred in illiterate cases and minimum (15.40 percent) in primary educated cases.

PLACE OF RESIDENCE IN RELATION TO ACCIDENTS

Table 5 shows that the vast majority of cases (71.30%) were from rural areas followed by 28.70 percent from urban area. In different types of accidents, accidental fall accounted for maximum 71.88 percent accidents in rural areas followed by 28.12 percent in urban. Motor vehicle accidents accounted for maximum 70.03 percent in rural areas, while 29.97 percent in urban. In other transport accidents, maximum 67.38 percent accidents were from rural areas followed by minimum 32.62 percent from urban areas.

SOCIO-ECONOMICAL CLASS IN RELATION TO ACCIDENTS

As shown in table 6, on the basis of modified classification of social class suggested by Prasad and his colleagues, highest number (60.20%) of accidents belonged to social class III whereas social class I contributed minimum number of accidents (1.20%).

In different types of accidents, the maximum number (83.37 percent) accidents were found by gun shot in social class III followed by 77.19 percent cases of machinery accidents in the same social class.

Maximum accidental falls (60.70%) were occurred in social class III and minimum (0.96%) accidents in social class I. Other transport accidents accounted for 68.45 percent accidents in social class III followed by 58.10 percent accidents by motor vehicle accidents.

TABLE No. 5 : Distribution of cases of accidents
by place of residence.

Type of accidents	Rural		Urban		Total	
	No.	%	No.	%	No.	%
Motor vehicle	229	70.03	98	29.97	327	32.70
Other transport	126	67.38	61	32.62	187	18.70
Falls	225	71.88	88	28.12	313	31.30
Machinery	47	82.46	10	17.54	57	5.70
Explosion	21	72.41	8	27.59	29	2.90
Gun shot	9	75.00	3	25.00	12	1.20
Other accidents	56	74.67	19	25.33	75	7.50
Total	713	71.30	287	28.70	1000	100.0

Rural = 713/1000

Urban = 287/1000

TABLE 6 : Distribution of accidents according to their socio-economical class.

Type of accidents	Socio-economical class											
	I		II		III		IV		V		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Motor vehicle	9	2.75	64	19.57	190	58.10	55	16.82	9	2.75	327	32.70
Other transport	-	-	24	12.83	128	68.45	35	18.72	-	-	187	18.70
Falls	3	0.96	34	10.86	190	60.70	79	25.24	7	2.24	313	31.30
Machinery	-	-	-	-	44	77.19	9	15.79	4	7.02	57	5.70
Explosion	-	-	9	31.03	10	34.49	9	31.03	1	3.45	29	2.90
Gun shot	-	-	-	-	10	83.34	1	8.33	1	8.33	12	1.20
Other causes	-	-	15	20.00	30	40.00	28	37.33	2	2.67	75	7.50
TOTAL	12	1.20	146	14.60	602	60.20	216	21.60	24	2.40	1000	100.0

TABLE 7 : Distribution of cases according to their marital status.

Type of accidents	Unmarried		Married		Widow		Divorced/ separated		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Motor vehicle	84	25.69	239	73.09	4	1.22	-	-	327	32.70
Other transport	71	37.97	114	60.96	2	1.07	-	-	187	18.70
Falls	106	33.87	201	64.22	6	1.92	-	-	313	31.30
Machinery	15	25.32	42	73.68	-	-	-	-	57	5.70
Explosion	8	27.59	21	72.41	-	-	-	-	29	2.90
Gun shot	4	33.33	8	66.67	-	-	-	-	12	1.20
Other causes	14	18.67	59	78.67	2	2.67	-	-	75	7.50
TOTAL	302	30.20	684	68.40	14	1.40	-	-	1000	100.0

MARITAL STATUS IN RELATION TO ACCIDENTS

As shown in table 7, maximum (68.40%) accidents occurred in married cases followed by unmarried (30.20%). Minimum accidents (1.40%) accidents were occurred in widows.

In different types of accidents, accidents caused by machinery accounted for 73.68 percent in married cases followed by unmarried (26.32%) cases.

Motor vehicle accounted for 73.09 percent accidents in married cases followed by 25.69 percent cases of accidents were unmarried.

Accidents by explosion accounted for 72.41 percent in married cases followed by 66.67 percent cases were contributed by gun shot in the same class.

Accidents due to other causes accounted for highest (78.67%) in all types of accidents in married cases.

TIME IN RELATION TO ACCIDENTS

The table 8 shows that 28.90 percent accidents occurred during evening hours (2-7 PM) and minimum 12.30 percent accidents were occurred during morning hours (2-10AM). Most of the accidents occurred during evening hours. In different types of accidents, explosion accounted for 41.38 percent accidents during early night hours (7-12 night) followed by 34.48 percent during evening hours (2-7 PM) due to same cause.

In motor vehicle accidents, 33.64 percent accidents were occurred during evening hours (2-7 PM) followed by 28.75 percent during early night (7-12 night). Gun shot accidents accounted for 33.33 percent during late night (12-5 AM) followed by 29.82 percent due to machinery accidents in the same time.

TABLE 8 : Distribution of cases according to time of occurrence of their accidents.

Type of accidents	Morning 5-10 AM		Noon 10AM-2 PM		Evening 2-7 PM		Early night 7 - 12 PM		Late night 12-5 AM		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Motor vehicle	32	9.79	35	10.70	110	33.64	94	28.75	56	17.12	327	32.70
Other transport	23	12.29	26	13.90	52	27.81	46	24.60	40	21.40	187	18.70
Falls	47	15.01	43	13.74	86	27.48	89	28.43	48	15.34	313	31.30
Machinery	6	10.53	7	12.28	11	19.30	16	28.07	17	29.82	57	5.70
Explosion	2	6.90	2	6.90	10	34.48	12	41.38	3	10.34	29	2.90
Gun shot	1	8.33	2	16.67	2	16.67	3	25.00	4	33.33	12	1.20
Other causes	12	16.00	9	12.00	18	24.00	21	28.00	15	20.00	75	7.50
TOTAL	123	12.30	124	12.40	289	28.90	281	28.10	183	18.30	1000	100.0

TABLE 9 : Distribution of cases of accidents according to their place of occurrence.

Type of accidents	Road		Home		Farm		Factory		Railway		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Motor vehicle	315	96.33	-	-	10	3.06	2	0.61	-	-	327	32.70
Other transport	156	83.42	3	1.60	4	2.14	-	-	24	12.83	187	18.70
Falls	28	3.95	193	61.66	81	25.88	11	3.51	-	-	313	31.30
Machinery	-	-	6	10.53	34	59.65	17	29.82	-	-	57	5.70
Explosion	1	3.45	3	10.34	25	86.21	-	-	-	-	29	2.90
Gun shot	3	25.00	1	8.33	8	66.67	-	-	-	-	12	1.20
Other causes	3	4.00	43	57.33	29	38.67	-	-	-	-	75	7.50
TOTAL	506	50.60	249	24.90	191	19.10	30	3.00	24	2.40	1000	100.0

PLACE OF OCCURRENCE IN RELATION TO ACCIDENTS

As shown in table 9, road accounted for maximum (50.60%) cases followed by 24.90 percent accidents in home. Minimum (2.40 percent) accidents were occurred in railway.

In different types of accidents, motor vehicles contributed 96.33 percent accidents on road followed by 86.21 percent cases in the farm by explosion, whereas 83.42 percent due to other causes of accidents on road. Gun shot accidents accounted for 66.67 percent cases in farm followed by 59.65 percent cases by machinery accidents at the same place.

CONTRIBUTORY FACTORS IN RELATION TO ACCIDENTS

Table 10 depicts that slippery floor accounted for maximum (16.70%) cases in all contributory factors followed by excessive speed contributed 13.10 percent and minimum accidents (0.20%) were occurred due to electrocution.

In different types of accidents, motor vehicles accounted for 25.99 percent accidents due to excessive speed and minimum due to unguarded machines and physical disability were responsible for only 0.30 percent cases each.

Accidental falls accounted maximum (29.71%) accidents due to slippery floor and the minimum (1.60%) cases were found due to physical disability. Accidents caused by explosion were found 58.62 percent due to inadequate light followed by gun shot cases (58.34%) due to other intoxicant.

TABLE 10 : Distribution of accidents according to contributory factors.

Factors	Motor vehicle		Other Transport		Falls		Machinery		Explosion		Gun shot		Other causes		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Poor physical health	30	19.17	22	11.76	55	17.57	4	7.02	3	10.34	-	-	9	12.00	123	12.30
Defective vision	19	5.81	13	6.95	56	17.89	10	17.54	7	24.14	-	-	7	9.33	112	11.20
Hearing defect	12	3.67	3	1.60	-	-	-	-	-	-	-	-	1	1.33	16	1.60
Physical disability	1	0.30	1	0.53	5	1.60	-	-	-	-	-	-	1	1.33	8	0.80
Alcohol	45	13.76	13	6.95	15	4.79	-	-	-	-	1	8.33	1	1.33	75	7.50
Other	24	7.34	3	1.60	14	4.47	-	-	-	-	7	58.34	22	29.34	70	7.00
Intoxicant																
Fatigue and sleeping	19	5.81	13	6.95	46	14.70	8	14.04	-	-	4	33.33	1	1.33	91	9.10
Excessive speed	85	25.99	36	19.25	-	-	10	17.54	-	-	-	-	-	-	131	13.10
Inadequate light	2	0.61	9	4.81	29	9.27	9	15.79	17	58.62	-	-	23	30.67	89	8.90
Slipper floor	25	7.65	41	21.93	93	29.71	-	-	2	6.90	-	-	6	8.00	167	16.70
Unguarded machines	1	0.30	2	1.07	-	-	12	21.05	-	-	-	-	-	-	15	1.50
Defective vehicles	64	19.57	31	16.58	-	-	4	7.02	-	-	-	-	2	2.67	101	10.10
Electrocution	-	-	-	-	-	-	-	-	-	-	-	-	2	2.67	2	0.20
TOTAL	327		187		313		57		29		12		75		1000	

ACCIDENTAL FALLS IN RELATION TO ACCIDENT

TABLE 11 : Distribution of cases of accidental falls by their nature.

Type of fall	No. of cases	Percentage
On ground	46	14.70
On floor	15	4.79
From sister's hand	1	0.32
Fall of stone and iron piece	45	14.38
From tree	39	12.46
Stairs, steps or ladders	95	30.35
Kachcha walls	12	3.83
Into tank or well	6	1.92
Into roof	33	10.54
From pole	3	0.96
From furniture	4	1.28
From other heights	14	4.47
TOTAL	313	100.00

As shown in table 11, fall from steps, stairs or ladder were the commonest varieties accounting for 30.35 percent cases of accidents followed by fall on ground accidents (14.70 %). Minimum accidents were occurred due to fall from sisters hand having only 0.32%.

MOTOR VEHICLESIN RELATION TO ACCIDENTS

TABLE 12 : Distribution of cases of motor vehicle accidents according to class of vehicle.

Type of vehicle	No. of cases	Percentage
Motor Bus	31	9.48
Motor Truck	38	11.62
Jeep	38	11.62
Motor cycle	73	22.32
Scooter	33	10.09
Tractor	86	26.30
Autorikshaw	1	0.30
Tempo	8	2.45
Moped	19	5.81
Total	327/1000	100.00

Table 12 shows that tractors accounted for maximum accidents having 26.30 percent followed by motor cycle having 22.32 percent. Minimum accidents were occurred due to autorikshaw (0.30%). In this series motor truck and jeep having 11.62 percent accidents each.

NON MOTOR VEHICLES IN RELATION TO ACCIDENTS EXCEPT TRAIN

TABLE 13 : Distribution of cases of other transport accidents by type of vehicle.

Type of non motor vehicle	No. of cases	Percentage
Cycle	76	40.64
Bullock cart	88	47.06
Train	23	12.30
TOTAL	187	100.00

Table 13 depicts that bullock cart accounted for maximum accidents (47.06%) followed by cycle having 40.64 percent. Minimum accidents were occurred due to train having 12.30 percent.

EXPLOSION IN RELATION TO ACCIDENTS

TABLE 14 : Distribution of 29 cases of accidents caused by explosion.

Type of explosion	No. of cases	Percentage
Gun powder	20	68.96
Crackers	9	31.03
TOTAL	29	100.00

Table 14 depicts that the most common cause of accidents was gun powder accounted for 68.96 percent followed by crackers accounted for 31.03 percent cases.

FARM MACHINERY IN RELATION TO ACCIDENTS

TABLE 15 : Distribution of cases of accidents caused by farm machinery.

Type of machinery	No.of cases	Percentage
Tractors	86	75.44
Threshers	25	21.93
Pumping set belt	3	2.63
TOTAL	114	100.00

Table 15 shows that maximum accidents (75.44%) accounted by tractors which were commonest in farm machinery followed by thresher accidents (21.33%). The minimum accidents (2.63%) were due to pumping set belt.

ALL OTHER CAUSES IN RELATION TO ACCIDENTS

TABLE 16 : Distribution of 75 accidental cases of other causes.

Causes of accidents	No.of cases	Percentage
Strike by Lathi/Iron rod	40	53.33
Animal	21	28.00
Sharp instrument	12	16.00
Electrocution	2	2.67
TOTAL	75	100.00

Table 16 shows that the maximum accidents (53.33%) were due to strike of Lathi(stick), iron rod followed by animal having 28.00 percent. The minimum accidents occurred due to electrocution contributed 2.67 percent.

RESULT IN RELATION TO ACCIDENTS

TABLE 17 : Distribution of accidents according to their results.

Types of accidents	Death		Disability				Total	
	No. %		Permanent		Temporary		No. %	
	No.	%	No.	%	No.	%	No.	%
Motor vehicle	11	3.36	62	18.96	254	77.68	327	32.70
Other transport	9	4.81	22	11.76	156	83.42	187	18.70
Falls	4	1.28	50	15.97	259	82.75	313	31.30
Machinery	2	3.51	46	80.70	9	15.79	57	5.70
Explosion	2	6.90	22	75.86	5	17.24	29	2.90
Gun shot	1	3.33	4	33.33	7	58.33	12	1.20
Other causes	2	2.67	13	17.33	60	80.00	75	7.50
TOTAL	31	3.10	219	21.90	750	75.00	1000	100.0

As shown in table 17, maximum temporary disability was found in 75.00 percent cases as result of accident followed by permanent disability in 21.90 percent cases. Deaths were occurred in 3.10 percent cases as result of accident in total.

In different types of accidents, other transport accidents accounted for maximum (83.42 %) cases of temporary disability followed by minimum (15.79%) cases due to machinery accidents. Maximum permanent disability (80.70%) was due to machinery accidents followed by minimum 11.76 percent permanent disability accounted by other transport accidents.

TABLE 18 : *Distribution of 219 cases of accidents according to percentage of their permanent disability.

Place of accidents	Percentage of permanent disability											TOTAL
	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100		
Road side	10	16	4	4	5	4	8	4	1	8	65	
Farm	8	11	5	3	4	1	30	13	-	14	89	
Factory	5	1	1	-	3	3	-	-	-	2	15	
Home	4	10	4	-	-	-	3	-	1	12	34	
Railway	2	1	-	-	-	1	7	-	4	1	16	
TOTAL	29	39	14	7	13	9	48	17	6	37	219	

EVALUATION OF PERMANENT DISABILITY

Table 18 depicts that maximum number (48) of patients were having permanent disability group of 61-70 percent followed by minimum number of cases (6) were having range of 81-90 percent disability.

According to occurrence of accidents at various places, maximum range of permanent disability 91-100 percent were found in 14 patients at farm followed by 71-80 percent range of permanent disability in 13 patients. Minimum range of permanent disability ranging from 1-10 percent in 8 patients.

Second commonest place was home where maximum range of permanent disability (91-100 percent) was found in 12 patients followed by minimum disability (1-10%) in 4 patients.

On road side accidents, maximum range of permanent disability (91-100%) was found in 8 patients followed by (1-10%) range disability in 10 patients.

In Factory accidents, maximum range of disability (91-100%) and minimum range of disability (1-10%) were found twice as compared to railway accidents.

DISCUSSION

DISCUSSION

The present study has been undertaken in Bundelkhand region on admitted patients of accidental injuries, who attended M.L.B. Medical College, ^{JHANSI} and associated hospitals which run the casualty facilities round the clock. The period of study was from 1 January, 1989 to 31 December, 1989. During this period, 1,000 cases of accidental injuries attended, in patient and out patient departments.

INCIDENCE

One of aims study aimed to investigate the rate of accidental injuries in Bundelkhand region. Bundelkhand region in fact, consists of 11 districts - 5 of Uttar Pradesh and 6 of Madhya Pradesh. Though the present study included cases only from these districts yet, There is possibility that some cases of accidental injury belonging to these districts, might have gone to the hospital for treatment which were not included in present study. Due to this reason, it was not possible to work out the accurate incidence rate of accidental injuries studied.

AGE AND SEX

The present study showed that maximum (61.90%) cases of accidents were found between 16-44 years of age group, while minimum (2.5%) cases were in the age group of

0-5 years. According to Gill et al (1977) maximum cases of accidents (51.25%) occur amongst school going age group.

The second maximum number of accidents (21.90%) were recorded in age group 45 years or above and the third common age group was 6-15 years, 14.20 percent accidents were observed in this group. The maximum (71.9 percent) accidents were occurred in by motor vehicle in the age group of 16-44 years in both the sexes.

The highest (78.9%) number of accidents were recorded in males as compared to females in all age groups. While Gill et al (1977) have also recorded maximum number of accidents in males. The age group of 15-44 years showed maximum difference; males accounted for 52.80 percent and females 8.6 percent.

RELIGION IN RELATION TO ACCIDENTS

In the table 3, shows that the most obvious findings were that Hindus constituted the majority (92.50%) of the total. Muslims behind this having 5.50 percent, Christian accounted for 1.20 percent, and Sikh and other contributed 0.80 percent in this study.

In motor vehicle accidents Hindus were more involved. They contributed 92.35 percent accidents because the population of Hindus is higher than others. Muslims contributed only 6.42 percent.

In other transport accidents Hindus accounted for 93.58 percent and Muslims contributed only 2.67 percent.

Accidents caused by falls, Hindus accounted for 92.33 percent which was more in all types of accidents and also Muslims contributed 5.75 percent. 94.74% accidents caused by machinery were occurred in Hindus while Muslims contributed only 5.26 percent.

Hindus were having higher number of accidents in respect to all types of accidents as (Table 2) compared to Muslims, Sikh and others.

EDUCATION IN RELATION TO ACCIDENTS

The present study showed that illiterate patients were having 46.60 percent accidents, primary educated cases accounted for 15.40 percent while secondary and college/higher educated patients contributed 20.20 percent, 17.90 percent respectively.

There was some variation in different types of accidents. In motor vehicle accidents, 20.18 percent accidents were occurred in illiterate group and 14.99 percent in primary educated group. 22.94 percent were in secondary educated patients. Patients having college/higher education contributed 41.90 percent.

In other transport accidents illiterate patients accounted for 59.90 percent, primary educated patients were having 12.46 percent and secondary, college/higher educated cases were having 18.18 and 6.42 percent respectively.

In accidental falls group, the majority (66.57%) were occurred in illiterate cases, 12.46 percent in primary

educated cases, 15.97 percent in secondary educated and 4.79 percent in college/ higher educated patients.

Accidents caused by machinery were more commonly occurred in patients of primary education(36.84%) and secondary educated cases having 28.07%. This is probably due to the larger number of machines and other crafts men involved who usually study upto secondary stage.

Majority of illiterate cases having all other accidents were 62.67 percent, while primary, secondary, college/higher educated cases less involved in accidents.

The figures suggested that persons of primary and secondary educated people were more at risk as compared to illiterate and those of higher educated in this study. Rastogi (1962) found that in Kanpur industries workers with higher education had lower accidents. Perhaps it was in the same for non industrial persons as well.

PLACE OF RESIDENCE IN RELATION TO ACCIDENT

Table 5 shows the distribution of the accidental cases according to their residence. A vast majority(71.30 percent) cases were from rural areas and only 28.70 percent were from urban.

Motor vehicle accidents were occurred in urban population (29.9%) and 70.03 percent in patients from rural areas. Of all urban patients, 34.15 percent had motor vehicle accidents while rural cases involved in motor vehicle accidents only 32.11 percent. This shows that relatively

more urban persons had automobile accidents. It may be due to differential exposure to hazards.

In other transport accidents, 67.38 percent cases were from rural areas and 32.62 percent were from urban area.

Accidental falls were more common in rural cases than urban dwellers. 71.88 percent falls were occurred in rural cases and 28.12 percent in urban patients. As shown in table 11, many of these occurred in field, from trees and other heights in connection with occupation, Probably rural areas which abound to farm and tree, therefore, accounted for a disproportionately large number of falls.

Accidents caused by machinery were about 5 times more commoner in patients from rural areas than from urban areas i.e. 82.46 percent and 17.54 percent.

Similar accidents due to explosion in rural cases and urban were 72.41 and 27.59 percent respectively.

Accidents due to gun shot were three times more in rural cases as compared to urban patients. Because of the rural population is much more than urban population in Bundelkhand region.

In all other accidents also, rural patients were more affected than cases residing in towns. The rural accounted 74.67% and urban group contributed 25.33 percent.

Considering the total, the cases residing in rural areas had 71.30percent injuries as against 28.70% of urban.

SOCIAL CLASS IN RELATION TO ACCIDENTS

All the cases were divided by the modified classification given by Prasad et al (1980).

The most affected social class was class III with 62.20 percent accidents. The next social class IV accounted for 21.60 percent and social class II has 14.60 percent and social class V was having 2.40 percent of accidents. Social class I (more than Rs. 600/- per head per month) had least accidents (1.2 percent).

Patients of social class III were having more automobile accidents (58.18%) than social class II who had 19.57 percent accidents.

94.50 percent patients were involved in social class ~~II~~, III and IV. Social class II to IV often travelled in buses and have same risk. Actually this increase was due to collision of bus with trees. Accidents were less in number in social class I and V. Probably social class I uses car with trained driver and take more precautions due to having higher education.

Bundelkhand is hilly area, road development is not good at many places, because of uneven topography, social class V patients used to walk on foot longer distance lowest income group also a major factors among them. So social class V patients were less involved.

In other transport accidents, most common social class III patients were involved having 68.45 percent while social class IV and II accounted for 18.72 and 12.83 percent respectively.

Accidents caused by falls were occurred in 60.70 percent of class III while social class II and IV contributed only 25.24 percent and 10.86 percent respectively.

In accidents caused by machinery group, 77.19 percent accidents were occurred in social class III while 15.79 percent in social class IV and 7.02 percent in class V. But social class I and II had no machinery accidents.

Social class III was more affected by accidents caused by explosion with 39.49 percent accidents while class II and IV had same only 31.03 percent of accidents. Accidents caused by Gun shot was found highest in social class III (83.34%) while in social class IV and V had same only 8.30 percent accidents.

Accidents caused by other causes, social class III was more involved.

Thus general observation remained that lower socio-economic status was more involved in accidents. There may be indirect relationship between socio-economic status and accidents.

Several surveys in Europe and U.S.A. showed relationship between poverty and domestic accidents. This may be related to poor housing. But British Medical Association found only slight association (WHO, 1965).

Poorer people had more accidents and more serious accidents (WHO, 1985). It needs further study to know what are the various causes.

MARITAL STATUS IN RELATION TO ACCIDENTS

Married patients had more accidents than unmarried cases. Former accounted for 68.40 percent and latter 30.20 percent. This is because of married population structure is vast. The widows contributing only 1.4 percent as a whole.

Motor vehicle accidents were commoner in married people in this series. They accounted for 73.09 percent of the motor vehicle accidents. The unmarried persons contributed 25.69 percent, while widows having only 1.22 percent.

These findings do not agree with the usual observations in Western countries that married patients had less motor vehicle accidents than unmarried or single patients. (Haddon et al, 1961; McCarrol et al, 1962; WHO, 1962 and 1966).

In other transport accidents, unmarried patients contributed 37.97 percent while married patients accounted for 60.96 percent while widows accounted for 1.07 percent.

Accidental falls were common in married patients where it accounted for 64.20 percent while unmarried cases contributed 33.87 percent and widow only 1.92 percent.

McQueen (1960) observed that in Scotland widowed persons relatively more falls. Perhaps this more related to age rather than widowhood itself, widowed persons more likely to be old than younger, though other factors like loneliness, lack of care of self may be relevant too. But in this study accidental fall is minimum in widowed persons.

In all types of accidents married cases had higher number of accidents because of married persons were more in communities.

TIME IN RELATION TO ACCIDENTS

The time wise distribution of accidents has been shown in table 8. Maximum (28.90%) accidents occurred during the evening hours (2-7 PM). Minimum accidents (12.30%) during morning hours (5-10 AM). Second highest accidents (28.10%) occurred during early night (7-12 night). Third highest total accidents occurred during late night (12-5 AM) (18.30%).

In noon time (10 AM to 2 PM), 10.40 percent accidents occurred.

In motor vehicle accidents, highest number were occurring during evening hours (2 PM to 7 PM) when there is a huge crowd of students, and persons returning from school and offices respectively. This accounted for 33.64 percent. It is surprising that there was no similar rise in the morning (5 to 10 AM) which is another busy time. Explanation could not be given for this. There is probability that persons are more push and attentive in the morning hours with better reflexes, while they may be somewhat tired in the evening period after day's work with slow perception and longer reaction time.

Haddon et al (1961), Mac Carrol et al (1962) and Barmack and Payne (1962) also observed similar rise of motor vehicle accidents in the evening and night (early and late) and low incidence in morning. It can be explained, the evening and night rise by social practice of drinking more alcohol in the evening. Though much smaller extent, but

few persons who drink alcohol one more likely to few of these accidents.

In the night, when traffic is thinner and thinner continued occurrence of motor vehicle accident while other accidents tapered off or even disappeared.

During other hours of day time automobile accidents occurred to lower extent and minimum in morning hours.

In all other transport accidents, there was less traffic by non motor vehicles at night. Largest number of other transport accidents were 27.81 percent in evening time (2 to 7 PM) and second highest of 24.60 percent during early night (7 PM to 12 night).

Accidents caused by falls, largest falls occurred during early night, i.e. 28.43 percent. Second maximum falls occurred 27.48 percent during evening hours (2 to 7 PM) It is so in Bundelkhand region most of persons used to go on their farm and used to come back in evening and at times in early night. In evening time older children are more active, playing or climbing on the trees. Some adults also used to pluck the dry branches of tree for cooking food.

Next highest number of falls, (15.00%) during morning hours (5 to 10 AM). This is due to occupational falls from various heights, wood cutters, plucking of fruits from trees.

Least number of falls (13.74%) during noon period (10 AM to 2 PM) were occurred.

Accidents caused by machinery : highest accidents (29.82%) were occurred during late night (12 night to 5 AM), second highest accidents caused by machinery were 28.07 percent in early night (7 PM to 12 night).

In morning time accidents were less and gradually increased as day passed and continued increased during night. In Calcutta factories, it has been observed that accidents were minimum at the beginning of the day and maximum towards the end. There is attributed to fatigue (Sabnis and Rao, 1961). This is true in our findings,

Accidents caused by explosion, highest (41.38%) during early night hours (7 PM to 12 night). Second highest accidents (34.48%) during evening hours (2 to 7 PM). Near conglomeration area in Jhansi there were some unblast Hathgola in Farms. Persons of low socio-economic status used to walk in farms to pickup the fragments of copper and other metals for livelihood. At times the pick up the Hathgola unknowingly some time due to sudden blast, they get explosion injury and developed various types of disabilities. Persons when passed through conglomeration area, in early night, their feet sudden stroke to Gola and explosion occurred. On festivals and marriage ceremony etc. most of the people used to cracker during early night.

Accidents caused by gun shot, highest number of accidents (33.33%) in late night (12 night to 5 AM). Most of the robbery occurred during late night and homicidal incidences also common in late night.

In all other causes, maximum accidents (28%) during early night (7 PM to 12 night). Minimum accidents (12.00%) during noon time (10 AM to 2 PM).

PLACE OF ACCIDENT IN RELATION TO ACCIDENT

The places where the accidents occurred have been shown in table 9. Road side accounted for 50.60 percent accidents while home contributed 24.90 percent accidents. Farm accounted for 19.10 percent while factory and railway were responsible for 3.06 and 2.40 percent respectively.

In motor vehicle accidents, 96.33 percent occurred on road. Second maximum accident on Farm (3.06%). Motor vehicle accidents accounted for 62.20 percent of all road accidents.

In other transport accidents, 83.42 percent accidents occurred on road, second maximum accident (12.83%) occurred in railway accidents. Minimum accidents (1.60%) occurred in home.

According to traffic police sources Bhopal city registered 1200 road accidents in 1979. According to hospital sources, road accidents accounted for 48.4 percent of all accidents, Agriculture accounted for 14.90 percent while industrial accidents accounted for 4.70 percent of all injuries. Similar trends found in table 9.

Accidental falls, majority of them 61.66 percent occurred in home. Gill et al (1977) observed that leading cause of accidents was fall accounting for 32.50 percent.

Between 50 to 80 percent of total falls were domestic and in all report of deaths, except from Japan, Ceylon and Nagpur, falls were the chief cause of these accidents.

Second maximum falls 25.88 percent on farm. While third maximum falls were 8.95 percent on road side. Minimum falls (3.51%) were in factory.

Accidents caused by machinery : maximum accidents 59.65 percent occurred in farms which was highest in all machinery accidents. While in factory and home accounted for 29.82 and 10.53 percent respectively.

Common machinery used in agricultural threshers chief cutting machine, Kolhu, conveyer belt, rice halling machines, i.e. in 1976. as many as 294 cases of thresher injuries reported from Punjab and in 1980, 301 cases were reported from Punjab due to thresher injuries (Agarwal, ND, 1985).

Accidents caused by gun shot : maximum (66.67%) and minimum (8.33%) accidents were occurred in farms and home respectively.

Accidents caused by explosion; maximum and minimum accidents were 86.21 and 3.45 percent in farm and road side respectively.

Accidents caused by other causes, maximum accidents accounted for 57.33 percent rural persons having animals in their house and farm, sharp instrument which are mostly used in agricultural work. Second minimum accidents by other

causes accounted for 38.67 percent and minimum (4.0%) accidents were occurred in road side.

CONTRIBUTORY FACTORS IN RELATION TO ACCIDENTS

Accidents are multifactorial in causation, It is impossible to pick up one as the cause of an accident.

Motor vehicle accidents : Excessive speed was the commonest appearing in 25.99 percent cases. Next in order of frequency defective vehicle accounted for 19.57 percent, alcohol 13.76 percent, poor physical health 9.17 percent and slippery floor 7.65 percent. Difficult routes (narrow uneven and winding roads are very common in Bundelkhand region) which reduce the range of vision, so accidents are more common. Minimum accidents (0.30%) were occurred due to unguarded machine.

In other transport accidents, slippery floor was the commonest contributory factors in 21.93 percent cases. Excessive speed was second common contributory factors in 19.25 percent cases. Unguarded machine was only in 1 percent cases, poor physical health contributed 11.7% cases.

In accidental falls : most important contributory factor was 29.7 percent of falls due to slippery floor and second common contributory factor was defective vision in 17.89 percent falls. Third commonest contributory factor was poor physical health (17.57%). Minimum contributory factors physical disability accounted for only 1.60 percent of all falls. Loose stones of kutchha walls or kutchha

steps, wet floor (cemented) or broken steps of ladder are important factors in causation of falls.

In accidents caused by machinery, most important factor was unguarded machine or absence of safety device contributing 21.05 percent.

In farm machinery i.e. threshers sometime persons separated the safety guard from thresher to earn the extra money. Persons loose their limb in absence of safety guard in machinery. Man used an eight horse power (8 H.P.) belt on 10 horse power engine (10 H.P.) and worked it fast (1,500 revolutions per minutes). The result was that instead doing the work faster, belt broke under the strain. In fraction of second one of its ends tied round his forearm and pulled it towards engine where they had got multiple injuries even crushed.

Sabnis and Gupta (1961) mentioned inattentiveness, carelessness, foolhardiness due to over confidence, ignorance, inexperience and slow cerebration as cause of factory (machinery) accidents.

Accidents caused by explosion, most important contributory factor was inadequate light in 58.62% cases.

In all other causes of accidents, most common contributory factor was inadequate light in 30.67 percent cases. In rural area most of animals are kept in a separated room having no light facilities. Bull horn injury more common in a room of inadequate light, where animals used to live. Minimum accidents due to fatigue and sleepi-

ness hearing defect, physical disability, alcohol having only 1.33 percent each of them.

Other intoxicant (Bhang, Ganja, Tobacco) having second most common contributory factor 29.34 percent.

Gupta (1961) stated that carelessness, poor maintenance and faulty design are responsible for about 60, 20 and 8 percent home accidents respectively.

ACCIDENTAL FALLS

Falls from stairs, steps or ladder were the commonest variety accounting to 30.35 percent. Second common falls on ground contributing 14.70 percent. Third common cause of fall was due to stones accounting to 14.38 percent. Fourth common cause of fall was fall from tree contributing 12.46 percent because of occupational causes.

Duraiswami (1961) stated that in the country side falls from trees were common.

Most common cause of falls in Bundelkhand region from stairs, steps or ladder. Most of the persons make stairs of clay without side support (Table 11).

Accidents by class of motor vehicle : highest number of accident 26.30 percent in all motor vehicle by tractor. Second highest number of accidents 22.32 percent contributed by motor cycles. Tractors are used very commonly in agriculture as well as in city for farming and transportation probably operated by untrained persons without following traffic rules.

Third highest accidents due to jeep and motor truck having 11.62 percent each of them. Scooter, motor car, and moped having 4th, 5th and 6th place respectively (Table 12). Minimum caused by autorikshaw accounting for 0.30 percent.

Motor cyclist and Pedal cyclist have much the worst casualty rate per kilometer, peak age from 10-19 years (Roads to safety, London, 1978).

Combining vulnerability with speed, motor cyclist (including scooter, and moped riders) are stimulated to have more than twice the deaths rate of cyclist, according to 1977 figures (B.M.J., 1977). Bundelkhand region mostly roads are full of ups and downs and curves and narrowing of roads causes more collision between four wheelers.

According to police sources, buses, specially private ones are often in worst state of repair than others. Breaks failure is more common.

ACCIDENTS BY CLASS OF NON MOTOR VEHICLE EXCEPT TRAIN

In non motor vehicles, bullockcart accounted for maximum 47.06 percent and second maximum accidents because of pedal cycles contributed 40.64 percent and train contributed 12.30 percent.

It is common practice of bullock cart drivers to sleep during long journey when oxen proceed slowly but steadily along familiar automatically observing traffic rules learned experience when oxen were new and

inexperienced lead accidents. Cycles are larger proportion among non motor vehicles (Table 13).

DISTRIBUTION OF ACCIDENTS CAUSED BY EXPLOSION

Gun powder contributed 68.96 percent and crackers accounted for 31.03 percent. Largest single variety was gun powder in festivals and marriage ceremony. Fire works in connection with festivals has been mentioned by Lal and Gupta (1961) as case of accidental blindness. Gun powder also cause lacerated injuries (Table 14).

DISTRIBUTION OF FARM MACHINERY

Higher number of farm machinery accidents accounted for 75.44 percent by tractors which very commonly used in agricultural works. Second highest farm accidents contributed 29.93 percent by thresher. Agarwal et al (1976) reported that increasing loss of limbs as result of thresher accidents accounted for 294 cases and in 1980, 301 cases were reported from Punjab.

Threshers are also very commonly used as farm machinery. Minimum accidents 2.63 percent occurred due to pumping set belt (Table 15).

DISTRIBUTION OF ALL OTHER CAUSES OF ACCIDENTS

Highest number of all other accidents (53.33%) accounted by stick and iron rods. Second highest number of accidents accounted due to animals having 28.00 percent. In rural areas persons are more prone to hit by animals like buffalo and oxen (domestic animals). Minimum accidents

2.67 percent occurred due to electric current.

59.60 percent of total accidents were found in lower limbs while 37.80 percent in upper limbs in present study. Seal et al (1964) reported that 49.00 percent and 24.00 percent of accidents were in lower and upper limbs respectively.

DISTRIBUTION OF CASES OF ACCIDENTS BY RESULT

The number of persons killed or temporary disabled or permanent disabled as a result of accidents. There were 75.00 percent temporary disability, 21.90 percent permanent disability and 3.10 percent of deaths as result of accidents.

Gordon et al (1962) conducted a survey of traumatic accident in four villages of Ludhiayana district, Punjab, India. They considered only those injuries which produced a disability for at least one day. The incidence was 115.6 per thousand persons were having 4.3 percent of permanent crippling. In different types of accidents, machinery accounted for maximum 80.70 percent permanent disability. The causes of steady increasing of disability because of mechanization, every grain harvesting, cane crushing season leaves hundred of farm workers without finger, hand and forearm, their limbs chopped off in thresher or mutilated in crushers. For optimum production farm owners encourage the labour to work overtime, even supplying them with drugs and drinks to keep them going.

In other transport accidents, accounted for maximum 83.42 percent temporary disability followed by 11.76 percent permanent disability. Bullock cart, cycles are less dangerous than machinery probably so that temporary disability is more as compared to permanent disability as a result of machinery accidents.

In accidental falls, maximum occurrence of temporary disability 82.75 percent followed by 15.57 percent permanent disability.

WHO (1965a) stated that 50 to 80 percent fatal falls are domestic and elderly females are more vulnerable except Japan, Ceylon and Nagpur. In Bundelkhand region, falls were on second place in causing temporary disability. Males were more prone to fall.

Explosion accounted for maximum 75.86 percent permanent disability followed by 17.24 percent temporary disability. Explosives cause more destructive of affected part so permanent disability occurred more.

Gun shot accidents, 33.33 percent permanent disability occurred followed by 58.33 percent temporary disability.

In motor vehicle accidents accounted for 18.96 percent permanent disability followed by 77.60 percent temporary disability.

Other accident accounted for 17.33 permanent disability while 80.00 percent temporary disability (Table 17).

EVALUATION OF PERCENTAGE OF PERMANENT DISABILITY

The evaluation of percentage of permanent disability based on expert group meeting on disability evaluation and national seminar on disability evaluation and dissemination, DGHS - WHO, AIIMS and courtesy of American Academy of Orthopaedics Surgeons, Chicago, USA (Appendix II).

As shown in table 18, 37 patients had maximum range of disability from 91-100 percent and 29 patients accounted for minimum range of disability less than 10 percent of total patients. According to different places of occurrence of accidents.

Road side

Eight patients had maximum permanent disability ranging from 91-100 percent followed by 1 patient developed permanent disability ranging from 81-90 percent, 10 patients had 1-10 percent permanent disability.

FARM

Fourteen patients developed permanent disability ranging from 91-100 percent followed by 13 patients had disability ranging from 71-80 percent, 8 patients had disability ranging from 1-10 percent.

Factory

Two patients developed permanent disability ranging from 91-100 percent followed by 3 patients had disability range from 51-60 percent, 5 patients accounted for minimum range of disability from 1-10 percent.

Home

Twelve patients had disability range from 91-100 percent followed by 1 patient was found to have disability range 81-90 percent, four patients had minimum disability ranging from 1-10 percent.

Railway

One patient developed maximum disability ranging from 91-100 percent followed by 4 patients accounted for disability range 81-90 percent. Two patients had disability ranging from 1-10 percent.

Farms were the first commonest place of accidents where maximum ranges of permanent disability (91-100%) in 14 patients followed by 12 patients in second commonest place. Home which had same range of maximum permanent disability. In our study, farm accidents accounted for maximum range of disability probably due to result of rapid large scale mechanisation of agriculture and inadequate safety precautions. There is no surveillance system for agricultural accidents.

Common machinery used threshers, Chaff cutting, machines, Kolhu, Rice halling machine, conveyer belts and Bakhar (instrument for ploughing). Second commonest place of accident for maximum range of disability (91-100%) was home in present study.

Majority of home accidents, 60 percent are due to negligence of parents and 20 percent are ascribed to poor maintenance of houses (Park JE, 1981).

Ghosh, BN et al (1971) reported that highest number of accidents (34.97%) at home probably that is why it is second commonest place of accident for maximum disability (91-100%).

Third commonest place was road side where 8 patients were found to have maximum range of permanent disability (91-100%). Road side accidents patients had more permanent disability as compared to home except disability range (91-100%) in 12 patients at home.

India has one of the highest road accidents rate in the world. One out of every 42 vehicles in the country met with an accident in 1986 (Park JE, 1989).

Illiteracy is more in Bundelkhand region for surviving pedestrians both serious head and lower limb injuries are typical, for surviving motor cycles riders injuries to the extremities occur with great frequency. For bicycles riders, lower limb injuries fairly common, foot injury in children from spokes. In car occupant among survivors, lower limb injuries are frequent cause of disability. Defective roads, unusual behaviour of men and animal, disregard of road sign, fatigue and alcoholism of drivers, cause more accidents and resulting significant disabilities.

In factory accidents, maximum range of permanent disability (91-100%) and minimum range of disability (1-10%) were more as compared to railway accidents. But disability range from 61-70 percent in railway accidents was found

more than 2 times as compared to factory accidents (Table 18). Because of amputation of extremities more common in railways accident so probably this range of permanent disability was found in railway accidents. In factory and railway accident, number of patients having permanent disability were less as compared to farm, home, and road side accident. Patients of railway accidents, majority of them went to railway hospital for further treatment. There are less number of factories in Bundelkhand region, majority of them treated in E.S.I. dispensaries and hospital, only few cases of major injuries were treated in this institution.

India is a vast country with variable social, cultural, geographical and economical background. Rapid industrialisation, mechanisation of farming and increase in vehicular traffic have increased accidents. The changing demographic picture with increase life expectancy, labour force and active working population in industries, urban or rural has brought in its wake a number of disability problems in all age groups and more so inproductive which require measures for disability evaluation and rehabilitation.

conclusions

CONCLUSION

C O N C L U S I O N

The present epidemiological study pertaining to accidental injuries (Locomotor system) has been undertaken in M.L.B. Medical College and associated hospitals, Jhansi. The study comprised of 1,000 cases of accidental injuries admitted in this hospital who were interviewed and followed up throughout the period of hospitalization.

The observations have led to following conclusions :

- The motor vehicle accidents were found to be maximum 32.70% whereas gun shot accidents were minimum(1.2%).
- Maximum accidental cases (61.40%) were found in age group of 16-44 years. Among them males were more than half (52.80%) and females were 8.60% only.
- Accidental cases were found to be maximum (92.50%) among Hindus whereas Sikh and others it was only 0.8%.
- Illiterate patients had maximum (46.60%) accidental injuries whereas primary level educated patients had minimum (15.40%) accidental injuries. Motor vehicles accounted for 41.90 percent accidents in college/higher level educated patients. Accidents caused by fall were found to be maximum (66.77%) in illiterates.
- Accidents were found to be maximum (71.30%) in rural area while it was 28.70% in urban area. Accidents caused by machinery were found to be maximum (82.46%) among rural patients.

- Social class III accounted for highest (60.20%) accidents whereas social class I contributed minimum number of accidents (1.20%). It was found that gun shot accidents accounted for maximum (83.34%) in social class III also.
- The percentage of accident was found to be maximum (68.40%) among married patients and minimum (1.40%) in widows. Accidents by other causes accounted for 78.67 percent were found among married patients.
- Higher percentage (28.90%) of accidents was observed during evening hours (2-7 PM).
- Accidents caused by explosion were found maximum (41.38%) during early night hours (7-12 PM) among all types of accidents.
- The road accidents were maximum (50-60%) whereas railway accidents were found to be minimum (2.40%), motor vehicles accounted for maximum (96.33%) in among all types of road accidents.
- In present study the accidental patients were found maximum (16.70%) due to slippery floor among all contributory factors but inadequate light accounted for 58.62 percent in explosion type of accident.
- Higher percentage (30.35%) of accidents were observed due to fall from steps stairs or ladder among all types of fall.

- Tractors accounted for maximum (26.30%) accidents among all type of motor vehicles whereas minimum (0.30%) accidents was due to autorikshaw.
 - It was found that 47.06 percent accidents were observed due to bullock carts as non motor vehicle accidents. Similarly accidents caused by cycle also.
 - Among farm machinery accidents were found to be maximum 75.44% percent due to tractor while accidents caused by threshers were 21.93 percent.
 - 53.33% accidents were observed due to strike of lathi/iron rods in other causes of accidents.
 - Accident of lower limbs was found more than the upper limbs. Accidents of lower limbs (59.60%) was found more than the upper limbs (37.80%).
 - In present study the temporary disability was found 75.00 percent, permanent disability was found 21.90 percent while such types of disability was found to be maximum 80.70 percent only machinery accidents among other deaths occurred 3.10 percent in all accidental cases.
 - (91-100%) range of permanent disability was found in 37 patients out of 219 permanent disabled cases, and 1-10% permanent disability was in 29 cases. However, 30 patients were of 61-70 percent permanent disability in farm accidents.
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SUGGESTIVE MEASURES

Accidents have now assumed an important place as a cause of morbidity and mortality in both developed and developing countries.

Various suggestive measures comprise the following :

I. DATA COLLECTION

Without adequate data collection, analysis and interpretation there could be no effective counter measures, evaluation and strategies for prevention.

2. SAFETY - EDUCATION

There is wide spread belief that accidents are inevitable. This fatalistic attitude must be curbed. Safety education must begin with school children. The drivers need to be trained in proper maintenance of vehicles and safe driving. Young people need to be educated regarding risk factors, traffic rules and safety precautions.

3. PROMOTION OF SAFETY MEASURES

a. Seat Belt

The use of seat belts reduces the number of fatalities and non fatal injuries by approximately 50 percent each. They should be made compulsory for car, light trucks and similar vehicles.

b. Safety Helmets

The helmet reduces the risk of head injury by

30 percent on average and that of fatalities by 40 percent. They prevent laceration of scalp to great extent. Recently the full face integral helmet become very popular.

c. Leather Clothing and Boots

Leather clothing reduces risk of extensive superficial soft tissue injury. Leather boots can, to some extent, protect lower leg and feet. Their use should therefore be encouraged.

d. Children

Another safety measure is to ensure that children remain seated when they are in vehicle. They should be prohibited to take the front seats of car. A few countries introduced laws which require that children of under 12-15 years in cars be in rear seats.

e. Others

These comprise use of door locks, proper vehicle design, use of laminated high penetration resistance wind screen glass etc.

4. ALCOHOL AND OTHER DRUGS

Alcohol impairs driving ability and increases the risk of an accident as well as the severity of its consequences. Several countries have shown that alcohol is the direct cause of 30 to 50 percent of severe road accidents. Although the legal limit is 80 mg/100 ml, impairment from alcohol can occur at blood alcohol levels as low as 50 mg/100 ml and accidents risk rises between 50 and 80 mg/100 ml.

5. PRIMARY CARE

Emergency care should begin at accident site, continue during transportation and conclude in the hospital emergency room. At any of these stages a life may be saved or lost, depending upon the skill of the health care worker and the availability of needed emergency equipment. There should be an accident services organisation and one fully equipped specialised trauma care hospital in all major cities.

6. ELIMINATION OF CAUSATIVE FACTORS

The factors which tend to cause accidents must be sought out and eliminated i.e. improvement of roads, imposition of speed limits, marking of danger points, reduction of electric voltage, provision of fire guards, use of safety equipment in industries, safe storage of drugs, poisons and weapons etc.

7. ENCORCEMENT OF LAWS

Legislation embodies codified of rules. These are enforced by the state to prevent accidents. These include driving tests, medical fitness to drive, inforcement of speed limits, compulsory wearing of seat belts and crash helmets, checking of blood alcohol concentration, road side breathtesting for alcohol, regular inspection of vehicles, periodic examination of drivers over the age of 55 years. In addition, there are factory and industrial laws to ensure safety of the people at work.

8. REHABILITATION SERVICES

Rehabilitation consists of a number of elements which each injured person should benefit. These are medical rehabilitation, social rehabilitation, occupational rehabilitation etc. The aim of rehabilitation is to prevent, reduce or compensate disability and thereby handicap.

9. ACCIDENT RESEARCH

The future of accident prevention is in research. Such research will be concerned with gathering precise information about the extent, type and other characteristics of accidents, correlating accidents experience with personal attributes and the environments in which accidents occur, investigating new and better methods of altering human behaviour, seeking ways to make environment safer, and evaluating more precisely the efficiency of control measures. This area is now termed as accidentology.

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A P P E N D I X

WORKING PROFORMA

EPIDEMIOLOGICAL STUDY OF ACCIDENTAL INJURIES (LOCOMOTOR
SYSTEM) IN BUNDELKHAND REGION

CASE No.

GENERAL INFORMATION

M.R.D. No.

DCA :

Pt's name :

DOD :

Age/Sex

Period of
hospitalisation

Address:

Rural/Urban

Education

Diagnosis:

Religion : Hindu/Muslim/Sikh/Christian/Others

Occupation: Farmer/Labour/Service/Business/Others

Income per month :

Total No. of : One/Two/three/four/five/more than five.
dependents

Social class : I/II/III/IV/V

Marital Status : Married/Unmarried/Widow

INJURY

Type of injury : Incised/Lacerated/Blunt

Time of Injury : Morning (5-10AM)/Noon (10AM to 2 PM) /
Evening (2-7PM)/Night (7PM to 5 AM).

Extent of Injury :

Nature of Injury : Superficial/Muscle deep/
bone deep/Amputation.

Cause of Injury : Thresher/Belt of pumping set/
tractor trolley/Sickle/Shovel/
Animal/Tangi/Sword/Knife/Others.

Place of Injury : Home/Farm/Factory/Road side.

Time lapsed between onset of :
injury and treatment taken

PERSONAL HISTORY

- a. Poor physical health/fever/
Diarrhoea/Headache/Others. Yes/No
- b. Defective vision/Night
blindness/Cataract/Others Yes/No
- c. Hearing defect : Wax or foreign body in ear/
otitis media/otosclerosis/
Eustachian obstruction.
- d. Physical Disability : Previous malunited fracture/
Previous Amputation of any
part of upper/lower limb/
paralysis.

MENTAL

Any History of taking

- a. Alcohol/Bhang/Ganja/Charas/
Biri/Cigarette/Tobacco Yes/No
- b. Fatigue : After more exertion/
more awakening in night. Yes/No

EMOTIONAL

Was there any H/O following: Anger/Fear Yes/No
before the onset of injury ? Stress

Was any following environmental condition
present at the time of injury ?

Inadequate lighting/Slippery floor/
unguarded Machine/Defective vehicle/
Electrocution.? Yes/No

Uptake of intoxicant prior to injury Yes/No

PHYSIOLOGICAL

After/Before meal : Yes/No (Hours between meal
and accident).

TREATMENT

- a. Conservative : Yes/No (C & D/Stitching/Plaster/
closed reduction).
- b. Operation : Yes/No (Surgical Toilet Debridement
Amputation/Open Reduction/
Internal Fixation etc.).

GUIDELINES FOR EVALUATION OF PERMANENT PHYSICAL
IMPAIRMENT OF TRUNK (SPINE)

The local effects of lesions of spine can be divided into traumatic and non-traumatic lesions.

TRAUMATIC LESIONS

Cervical Spine Fracture

Percent Whole Body
Permanent Physical
Impairment and Loss
of Physical Function
to Whole Body.

- | | |
|---|----|
| A. Vertebral compression 25%, one or two vertebral adjacent bodies, no fragmentation, no involvement of posterior element, no nerve root involvement, moderate neck rigidity and persistent soreness. | 20 |
| B. Posterior elements with X-ray evidence of moderate partial dislocation. | |
| a. No nerve root involvement, healed | 15 |
| b. With persistent pain, with mild motor and sensory manifestations. | 25 |
| c. With fusion, healed, no permanent motor or sensory changes. | 20 |
| C. Severe dislocation, fair to good reduction with surgical fusion. | |
| a. No residual motor or sensory changes | 25 |
| b. Poor reduction with fusion, persistent radicular pain, motor involvement, only slight weakness and numbness. | 35 |
| c. Same as (b) with partial paralysis, determine additional rating for loss of use of extremities and spincters. | |

Cervical Intervertebral Disc

- | | |
|---|----|
| 1. Operative, successful removal of disc, with relief of acute pain, no fusion, no neurologic residual. | 10 |
| 2. Same as (1) with neurological manifestations, persistent pain, numbness, weakness in fingers. | 20 |

Thoracic and Dorsolumbar Spine Fracture

- A. Comparession 25%, involving one or two vertebral bodies, mild, no fragmentation, healed, no neurological manifestations. 10
- B. Compression 50%, with involvement posterior elements, healed, no neurologic manifestations, persistent pain, fusion indicated. 20
- C. Same as (B) with fusion, pain only on heavy use of back. 20
- D. Total paraplegia 100
- E. Posterior elements, partial paralysis with or without fusion, should be rated for loss of use of extremities and sphincters.

Low Lumbar

1. Fracture :

- A. Vertebral compression 25%, one or two adjacent vertebral bodies, little or fragmentation, no difinite pattern or neurologic changes. 15
- B. Compression with fragmentation posterior elements, persistent pain, weakness and stiffness healed, no fusion, no lifting over 25 pounds. 40
- C. Same as (B), healed with fusion, mild pain 25
- D. Same as (B), nerve root involvement to lower extremities, determine additional rating for loss of industrial function to extremities.
- E. Same as (C), with fragmentation of posterior elements, with persistent pain after fusion, no neurologic findings. 35
- F. Same as (C), with nerve root involvement to lower extremities, rate with functional loss to extremities.
- G. Total paraplegia 100
- H. Posterior elements, partial paralysis with or without fusion, should be rated for loss of use of extremities and sphincters.

2. Neurogenic Low Back Pain - Disc Injury

- A. Periodic acute episodes with acute pain and persistent body list, tests for sciatic pain positive, temporary recovery 5 to 8 weeks. 5

- B. Surgical excision of disc, no fusion, good results no persistent sciatic pain. 10
 - C. Surgical excision of disc, no fusion, moderate persistent pain and stiffness, aggravated by heavy lifting with necessary modification of activities. 20
 - D. Surgical excision of disc, \bar{C} fusion activities of lifting moderately modified. 15
 - E. Surgical excision of disc with fusion, persistent pain and stiffness aggravated by heavy lifting, necessitating modification of all activities requiring heavy lifting. 25
-

GUIDELINES FOR EVALUATION OF PERMANENT PHYSICAL IMPAIRMENT IN AMPUTEES

BASIC GUIDELINES

1. In case of multiple amputees, if the total sum of percentage permanent physical impairment is above 100%, it should be taken as 100%.
2. Amputation at any level with uncorrectable, inability to wear and use prosthesis, should be given 100% permanent physical impairment.
3. In case of amputation in more than one limb percentage of each limb is counted and another 10% will be added, but when only toes or fingers are involved only another 5% will be added.
4. Any complication in form of stiffness, neuroma, infection etc. has to be given a total of 10% additional weightage.
5. Dominant upper limb has been given 4% extra percentage.

Upper Limb Amputations

Percent Permanent
Physical Impairment
and loss of physical
function of each limb.

1. Fore-quarter amputation	100%
2. Shoulder Disarticulation	90%
3. Above Elbow upto upper 1/3 of arm	85%
4. Above Elbow upto lower 1/3 of arm	80%
5. Elbow disarticulation	75%
6. Below Elbow upto upper 1/3 of forearm	70%
7. Below Elbow upto lower 1/3 of forearm	65%
8. Wrist disarticulation	60%
9. Hand through carpal bones	55%
10. Thumb through C.M. or through 1st MC joint	30%
11. Thumb disarticulation through metacarpo-phalangeal joint or through proximal phalanx.	25%
12. Thumb disarticulation through inter phalangeal joint or through distal phalanx.	15%

	Finger			
	Index (15%)	Middle (5%)	Ring (3%)	Little (2%)
13. Amputation through proximal phalanx or disarticulation through MP joint.	15%	5%	3%	2%

14.	Amputation through middle phalanx or disarticulation through PIP joint.	10%	4%	2%	1%
15.	Amputation through distal phalanx or disarticulation through DIP joint.	5%	2%	1%	1%

Lower Limb Amputations

1.	Hind quarter	100%
2.	Hip disarticulation	90%
3.	Above knee upto upper 1/3 of thigh	85%
4.	Above knee upto lower 1/3 of thigh	80%
5.	Through knee	75%
6.	B.K. upto 8 cm	70%
7.	B.K. upto 1/3 of leg	60%
8.	Through Ankle	55%
9.	Syme's	50%
10.	Upto mid foot	40%
11.	Upto fore-foot	30%
12.	All toes	20%
13.	Loss of first toe	10%
14.	Loss of second toe	5%
15.	Loss of third toe	4%
16.	Loss of fourth toe	3%
17.	Loss of fifth toe	2%

APPROXIMATE RATINGS OF PERMANENT PHYSICAL IMPAIRMENT
AND THEIR PHYSICAL LOSS OF FUNCTION

LOWER EXTREMITIES	Percent Permanent Physical Impairment and Loss of Physical function to Lower Extremity.
1. Shortening	
1/2 inch	5
1 inch	10
1 1/2 inches	15
2 inches	20
2. Hip(Rating value to whole body 50%)	
A. Non union without reconstruction	75
B. Arthroplasty, use of prosthesis able to walk and stand at work, motion free to 25% to 50% of normal.	40
C. Osteotomy reconstruction, moderate motion, 1 inch shortening no contracture.	35
D. Ankylosis and limited motion	
a. Total ankylosis, optimum position 15" flexion.	50
b. Limitation of motion	
1. Mild, A.P. motion from 0° to 120° flexion, rotation and lateral motion abduction, adduction free to 50% of normal.	15
2. Moderate, A.P. motion from 15° flexion deformity to 110° further flexion, rotation, lateral motion, abduction, and adduction (free to 25% normal.	30
3. Severe, A.P. motion from 30° flexion deformity to 90° further flexion.	50
3. <u>Knee</u>	
A. Surgical removal internal or external semilunar cartilage, no complications.	5
B. Surgical removal both cartilages cruciate intact.	20
C. Ruptured cruciate ligament, repaired, moderate laxity.	20
Not repaired, marked laxity	30

D.	Excision of patella	20
E.	Plateau fracture, depressed bone elevated, semilunar excised.	20
F.	Ankylosis and limited motion, total ankylosis optimum position, 15" flexion.	50
G.	Limitation of motion	
a.	Mild, 0° to 110° flexion	5
b.	Moderate, 0° to 80° flexion	15
c.	Severe, 0° to 60° flexion	35
d.	Severe limited from 15° flexion deformity with further flexion to 90°	40

Percent Permanent
Physical Impairment and
Loss of Physical Function
to Foot (80% of leg)

4. Ankle and Foot

A.	Eversion deformity 25° as in fracture lower end of fibula with evulsion medial ligaments, 20° eversion.	20
B.	Inversion deformity 20°	15
C.	Total ankylosis ankle and foot (Pantalar arthrodesis)	
a.	10° plantar flexion	50
b.	Mal-position 30° plantar flexion	60
D.	Ankylosis of foot, subtalar or triple arthrodesis tarsal bones, ankle, free motion.	25
E.	Ankylosis of tibia and talus, subtalar joints free, optimum position 15° plantar flexion.	40
F.	Limitation of motion in the ankle	
a.	Mild, motion limited from position of 90° right angle to 20° plantar flexion.	10
b.	Moderate, Motion limited from position of 10° plantar flexion to 20° plantar flexion.	25
c.	Severe Motion limited from position of 20° plantar flexion to 30° plantar flexion.	50

Percent Permanent
Physical Impairment and
Loss of Physical Function
of foot

5. Foot

- A. Ankylosis of tarsal metatarsal or
or mid tarsal joints
- | | |
|--------|----|
| Mild | 10 |
| Severe | 20 |
- B. Limited Motion in the foot
- | | |
|---|----|
| a. Mild, Limited motion with mild pain | 10 |
| b. Moderate, Limitation of motion with pain | 20 |
| c. Severe, Limitation of motion with pain | 35 |

Percent Permanent
Physical Impairment and
Loss of Physical Function
to Toe

6. Toes

- A. Complete ankylosis of metatarsophal-
langeal joint, any toe. 50
- B. Complete ankylosis any toe, interphalangeal 10
joint, favourable, position semi-flexion.

UPPER EXTREMITIES

Percent Permanent
Physical Impairment and
Loss of Physical function
to Whole Arm

7. Shoulder

- A. Total ankylosis in optimum position, 50
abduction 60° flexion 10°, rotation,
neutral position.
- B. Total ankylosis in mal-position Grade upward
- C. Limitation of motion
- | | |
|--|----|
| a. Mild, No abduction beyond 90°, rotation
only 40° with full flexion and extension. | 5 |
| b. Moderate, No abduction beyond 60°
rotation only 20°, with flexion and
extension limited to 30°. | 20 |
| c. Severe, No abduction beyond 25°
rotation only 10°, flexion and
extension limited to 20°. | 50 |
- D. Recurrent dislocation as frequently as 35
every 4 to 6 months.

- E. Resection distal end of clavicle (rate motion independently). 5

8. Elbow

Flexion and extension of forearm considered as 85% of arm, rotation of forearm considered as 15% of arm.

- A. Total ankylosis in optimum position approximating mid-way between 90° flexion and 180° extension (45° angle) (45° angle). 50
- B. Total ankylosis in mal-position Grade upward
- C. Limitation of motion.
- a. Mild, Motion limited from 10° flexion to 100° further flexion. 10
- b. Moderate. Motion limited from 30° flexion to 75° further flexion. 20
- c. Severe. Motion limited from 45° flexion to 90° further flexion. 35
- D. Flail elbow, pseudarthrosis above joint line, wide motion but every unstable. 65
- E. Resection head of radius 15

Percent Permanent
Physical Impairment and
Loss of Physical Function
to hand

9. Wrist

- Excision distal end of ulna, flexion and extension credited with 75% of hand, and rotation 25% of hand 10
- A. Total ankylosis in optimum position 35
- B. Total ankylosis in mal-position of extreme flexion or extension. Grade upward
- C. Limitation of motion.
- a. Mild. Rotation normal, 15° palmar flexion to 20°, dorsi-flexion. 10
- b. Moderate. Rotation limited in 30° in semi-pronation, palmar flexion 10°, dorsiflexion 10°. 20
- c. Severe. Rotation limited to 10° in position of full pronation, palmar flexion 50, dorsiflexion 50. 25

Percent Permanent
Physical Impairment and
Loss of Physical function
to Individual Finger.

10. Fingers - Ankylosis of joint

A. Any digit(excluding the thumb)

a. Total ankylosis of distal joint	
1. Optimum position	25
2. Mal-position(fixed 35° or more)	35
b. Total ankylosis of proximal interphalangeal joint.	
1. Optimum position (flexed 35°)	50
2. Mal-position (approximately full extension or full flexion)	75
c. Total ankylosis of both distal and proximal interphalangeal joints.	
1. Optimum position	75
2. Mal-position	100
d. Total ankylosis metacarpophalangeal joint	
1. Optimum position (45° flexion)	45
2. Mal-position(approximately full extension or full flexion)	75
e. Total ankylosis both interphalangeal joints and metacarpophalangeal joint	100

B. Thumb

a. Total ankylosis interphalangeal joint	
1. Optimum position (0° to 15°)	40
2. Mal-position(flexion geater than 15°)	65
b. Total ankylosis metacarpophalangeal joint	
1. Optimum position (upto 25° flexion)	50
2. Mal-position(flexion greater than 25°)	65
c. Total ankylosis both interphalangeal and metacarpophalangeal joints.	
1. Optimum position	75
2. Mal-position	85
